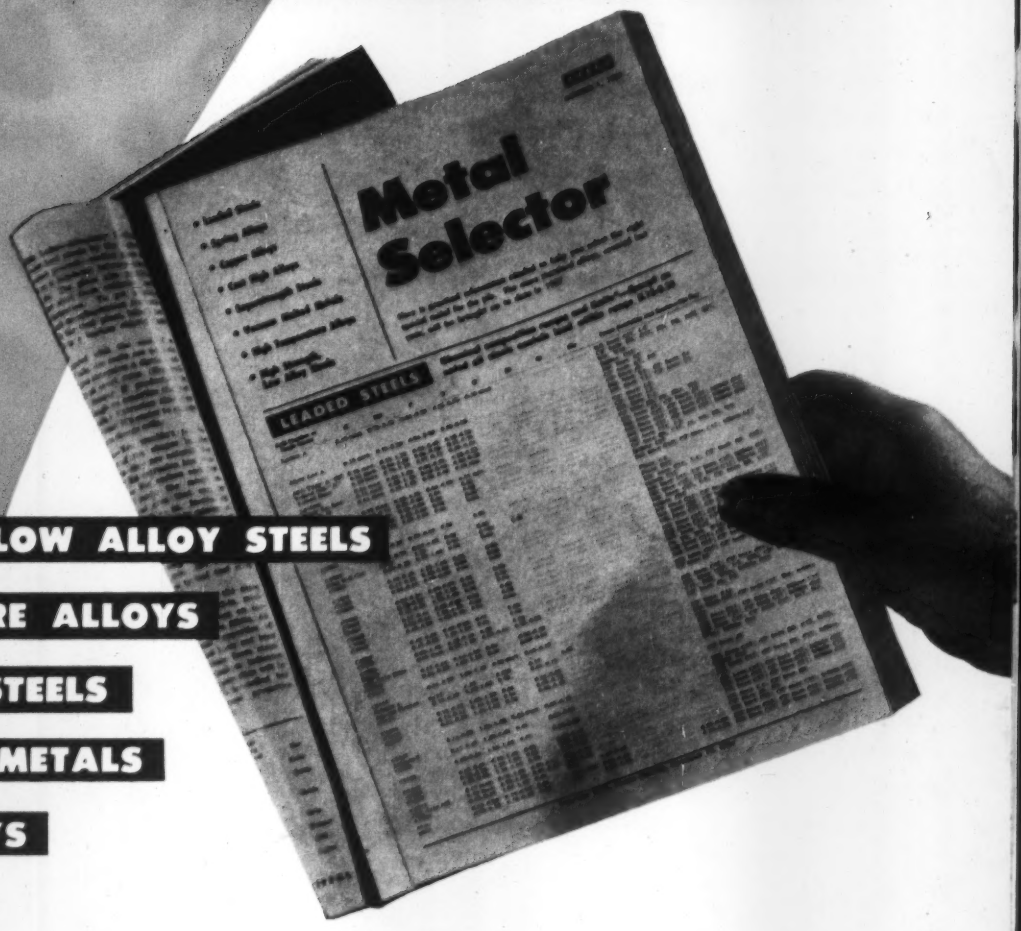
OCTOBER 1, 1956

STEEL

The Metalworking Weekly

A PENTON PUBLICATION



HIGH STRENGTH, LOW ALLOY STEELS

HIGH TEMPERATURE ALLOYS

SUPERSTRENGTH STEELS

VACUUM MELTED METALS

CAST HIGH ALLOYS

SPRING ALLOYS

COPPER ALLOYS

LEADED STEELS

Metal Show Issue

- The Metal Selector ..... page 162
- Natural Gas Plays a Bigger Role page 124
- Program and Exhibitors ..... page 169
- New Equipment at the Show page 253

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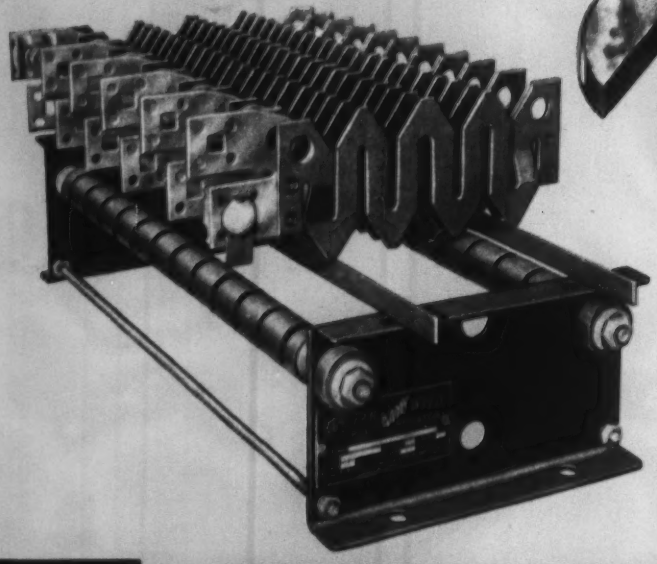
HANDS OFF!

EC&M TAB-WELD RESISTORS REQUIRE *MINIMUM* MAINTENANCE

Only EC&M TAB-WELD PLATE RESISTORS are both bolted and welded for *constant current path*. Unlike other resistors, they do not require periodic tightening of clamping nuts to compensate for loss of pressure caused by alternate heating and cooling. Grids are offset and mating ends are spot welded. Tap-plates are also welded into place at close intervals along the grid assembly.

This exclusive EC&M construction offers 4 big advantages on heavy duty motor applications: (1) stabilized ohmic value (2) no burning at grid-eyes or at tap-plates (3) easy tap-shifting for best motor performance and (4) long life with virtually no maintenance!



FEATURES THAT REALLY COUNT!

- Nonbreakable
- Corrosion-resistant alloy steel
- Negligible resistance change between cold and maximum working temperatures
- Offset resistor ends spot-welded
- No burning at grid-eyes
- No burning at taps
- Small adjustments in resistance value easily made
- Insulating spacers remain dimensionally stable
- No periodic tightening of clamping nuts
- All standard sections same size
- Double insulation to ground
- Fast connection to any tap-plate

Write for illustrated Bulletin No. 942-B
Complete data on EC&M TAB-WELD RESISTORS

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28, OHIO

7404

Television set is an RCA Victor "Personal" model.

Portable TV: coming up fast

Television in the home is taken for granted today, just as radio was fifteen or twenty years ago. What Americans are reaching for now is television they can carry around and plug in anywhere; in other words portable TV. What's more, they are getting it!

And as portable television gains in popularity, it calls for ever more sheet steel. Bethlehem sheets are used in the chassis of many of these portable sets, in tonnages undreamed of just a few short years ago.

So, too, with other products which have become big business in the decade since World War II. Air conditioners, for example. And farm machinery. Radiant baseboard heating systems. Steel fireplaces, outdoor barbecues and metal ironing boards. These and many others depend for their continued success on the strength and workability of fine sheet steel.

At the same time, the sheet steel requirements of longer-established users are growing too. All added together, they keep our Sparrows Point and Lackawanna sheet mills jumping. You may be sure we are doing everything humanly possible to meet the tremendous demand.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM SHEETS

BETHLEHEM STEEL

Maintenance cut 49% with SKF® anti-friction bearings

SKF "Triple-Seal" Pillow Blocks, used by an eastern limestone producer in pulverizing tube mills, have saved thousands of dollars since their installation in 1948.

In comparable operating periods, counter-shaft failures dropped from 11 to 2, bearing maintenance costs were cut 49%, production increased 70%, power savings averaged 10% to 20%.

Required to operate in a highly abrasive "snowstorm" of powdered limestone, these triple-sealed units continue to save money for the user. They will do the same for you.

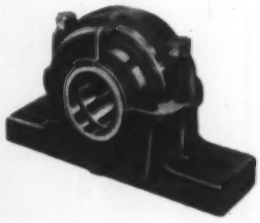
For further information on how these remarkable "Triple-Seal" Pillow Blocks can be applied most effectively to your products, get in touch with your local **SKF** Sales Office. 7730

SKF

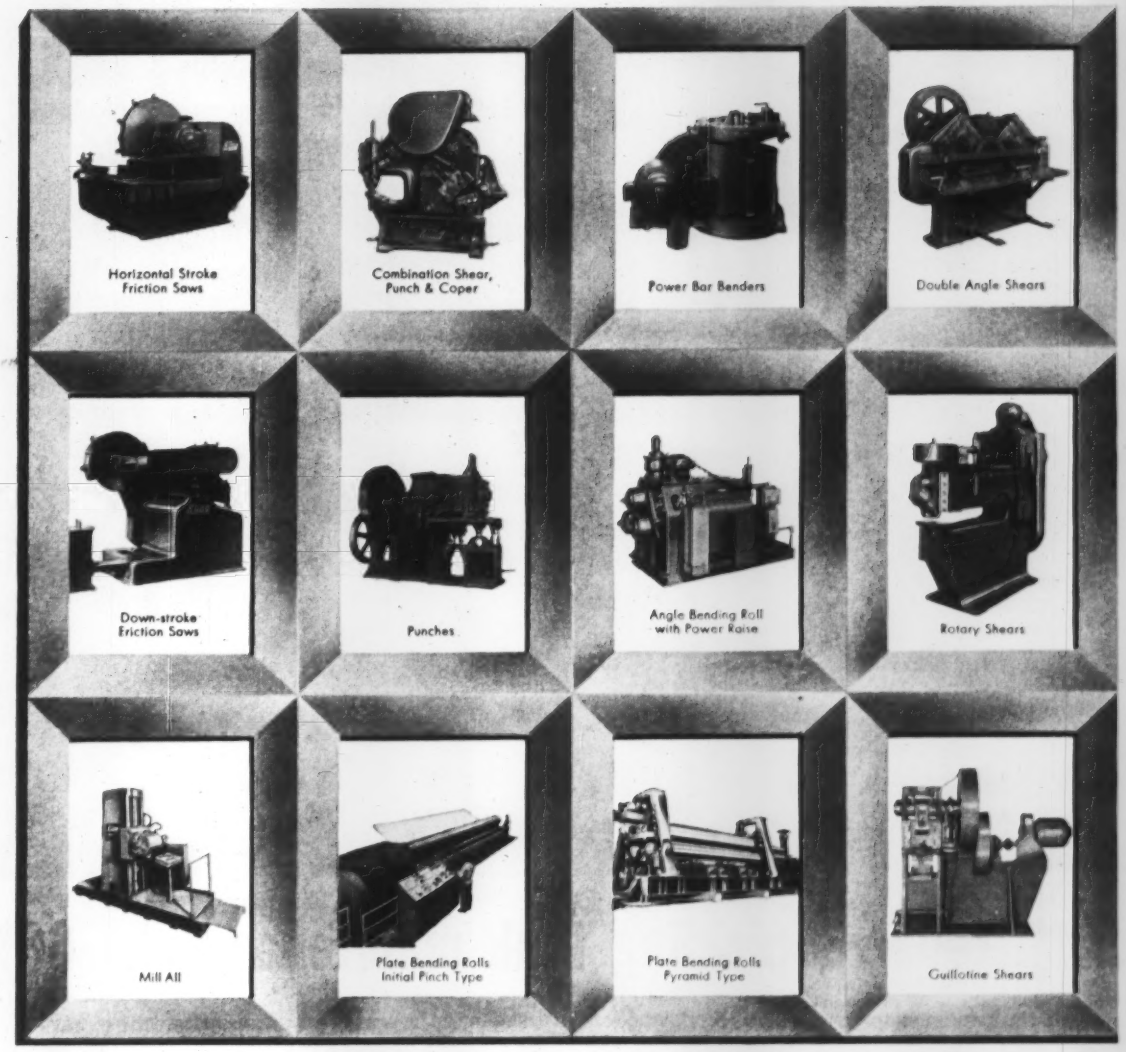
EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings ("Tyson")*

*Reg. U.S. Pat. Off. Tyson Bearing Corporation



SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.



New Answers from Kling to Cut Your Costs in . . .

- **Friction Sawing**
- **Shearing**
- **Punching**
- **Notching**
- **Bending** (Plate and Structural)
- **Mitering**
- **Forming**
- **Coping**

. . . and other operations involved in fabricating steel and non-ferrous metals.

Your answer may be a new Kling Universal Beam Punch equipped for automation . . . or a new Mill-All that does more facing jobs at lower cost . . . or a new Plate Bending Roll for rolling heavy plate sections such as airplane wing skins, pressure vessels, tanks, boat hulls, etc.

Whatever new Kling machine you need, you are assured that it will provide the newest, finest answer to your production problem. New answers to metal working problems have been a specialty with Kling for over 60 years. Why not give Kling engineering an opportunity to show what it can do in cutting your costs? Write today for Data Bulletins on the Kling machines shown above.

Since 1892

Kling

Active Kling Distributors cover practically every marketing area of U.S. and Canada. Write us for name of one nearest you.

BROS. ENGINEERING WORKS

1320 N. KOSTNER AVE. • CHICAGO 51, ILLINOIS

Makers of Friction Saws; Shears—Rotary, Double-Angle and Guillotine; Punches; Combination Shear, Punch and Coper; Angle and Plate Bending Rolls; Bulldozers.

Export Distributor: Simmons Machine Tool Corp., 50 E. 42nd St., New York 17, New York

Canadian Distributor: Brown-Boggs Fdry. & Machine Co., Hamilton, Ontario

1517

G.T.M. reduces pickling tank maintenance by 66%

ALMOST weekly repair of a lead-lined, wooden pickling tank was a major problem for this Midwestern steel processor. Maintenance cost alone ran into the thousands of dollars every year. Moreover, the lead often stuck to the steel strip, causing additional problems.

Finally it was decided to install a steel tank. The G.T.M.—Goodyear Technical Man—recommended a PLIOWELD rubber lining plus two courses of acid-resistant brick. He also helped to develop a series of unique thermal expansion joints between the 40-foot tank sections. Result: *No shutdowns in two years*, except for normal cleaning—maintenance slashed to *one-third its former cost.*

Similar savings may be yours on any industrial rubber application by consulting the G.T.M. Contact him through your Goodyear Distributor, or write Goodyear, Industrial Products Division, Akron 16, Ohio.

PLIOWELD TANK LININGS by

GOODYEAR

THE GREATEST NAME IN RUBBER

Pliowald—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

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SELF TAPPING SELF LOCKING

PHEOLL

SCHWEPPE STUDS

Patents Pending

CUT COSTS

1 ELIMINATE TAPPING

2 HOLD TIGHTER

3 CAN BE 'AUTOMATED'

WHEREVER a stud is specified, you can profitably cut production time and cost with self-tapping, self-locking Schweppe Studs. They also can replace bolts to advantage on many applications.

WHAT ARE SCHWEPPE STUDS?

They are double-ended studs made with dual thread-cutting slots at the lower end. Final threads on this end develop a positive frictional interference locking action on entering the hole.

HOW ARE THEY DRIVEN?

Schweppe Studs can be driven in an inexpensive *drilled* hole with any power stud driver. In one simple, continuous operation, they cut their own thread, drive, lock and seal.

WHAT ARE THEIR ADVANTAGES?

The *self-tapping* feature eliminates tapping time and thread inspection, tap wear and replacement, tap breakage and salvage time. The *self-locking* action of Schweppe Studs prevents loosening or backing out, even under extreme conditions.

WHAT ABOUT AUTOMATION?

Since Schweppe Studs may be located accurately from the slotted end, they can be "hopperized" for automatic feeding and driving.

• To fit many applications, Pheoll Schweppe Studs can be furnished in a broad range of metals, finishes, sizes and thread styles. Learn how you can profit . . . find out about the many advantages . . .

Write for free Bulletin 1056

PHEOLL MANUFACTURING COMPANY

SCREWS • BOLTS • NUTS

5708 Roosevelt Road, Chicago 50, Ill.

ROLL SHAFT COUPLING

...the *only* Coupling with truly Spherical Teeth

This exclusive coupling is widely endorsed for use on Tandem cold mills, Hot mills, Roller levellers, Pinch rolls, Slitters, etc.—wherever counter-rotating rolls are found—where compensation for angular and parallel displacement is required to facilitate roll changing—and to compensate for variable roll centers due to work roll grinding and/or due to thickness of material requirements. Sphereflex Roll Shaft Couplings give ±7% angular capacity, with a very minimum of backlash.

Sphereflex is the *only* coupling with truly *spherical teeth:* Root diameter, pitch diameter and outside diameter are generated as segments of concentric circles, giving a ball and socket action, and assuring highest torque-carrying capacity . . . all mating teeth maintain an area contact under load at the center of the male cut teeth, thereby *preventing rolling point contact* at maximum misalignment.

All exclusive points of design and construction of this unusual coupling are illustrated and explained in Bulletin C-561 . . . Send for copy on your Business Letterhead.

See the newest developments in Mechanical Power Transmission at our Booth #80—22nd National Power Show, New Coliseum, New York City, November 26-30.

phillie gear®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS
LIMITORQUE VALVE CONTROLS
FLUID AGITATORS • FLEXIBLE COUPLINGS

Virginia Gear & Machine Corp. • Lynchburg, Va.

behind the scenes

Metal Selector

When Noah Webster got around to the word "metal," he sharpened his goose quill and wrote with a flourish: "Metal is an opaque substance that shows a peculiar luster, is a good conductor of heat and electricity and can be fused."

Now, that is not a shining example of precise definition, but it was the best our boy could do. Some folks claim he wasn't such a hot writer. Generally, Noah wrote some pretty dead stuff; nowadays scarcely anybody ever curls up with a copy of his *"Historical Notices of the Origin and State of Banking Institutions and Insurance Offices."* Curiously, however, no one has come up with a better definition of metals—no one, that is, until STEEL came out with its Metal Selector. (Ha! The people who do television commercials aren't the only ones who can be sneaky.)

Last year, STEEL's Metal Selector (for standard alloys) was an editorial highlight. It drew more than a thousand requests for additional copies. This year, the editors worked long and hard on the Metal Selector (for special alloys) which is inserted in this week's issue. It was a monumental job any way you look at it—and the best way to look at it is, of course, carefully. Technical Editor Dr. Al Gray was in charge of the project, and he perspired profusely over the copy until he satisfied himself that all definitions were correct. Then he turned the work over to Art Director Bill Kellogg, who took one look at it, and suddenly wished he were in Zanzibar.

Tests Without Cheer

The manuscript was typed on great sheets measuring 2 ft by 15 in.; they drifted over Kellogg's desk like Monday's wash. When he accidentally tried the daylight test on these sheets by holding them near the window (from which he must have been tempted to throw them), he was astonished to see thousands and thousands of tiny characters, all begging to be specified. He counted characters night and day, and when his eyes turned pinker than usual, he called in one of his assistants, Charlie Van Dame. Tabular matter is rough stuff to assemble in readable form, so we take this opportunity to compliment Kellogg and Van Dame on their excellent arrangement of STEEL's Metal Selector. You will find that it is one of the most useful things ever published by this magazine.

Double Plug

By an odd coincidence (who says our editors aren't foxy?) STEEL's Metal Selector will appear the week before the 38th National Metal Congress & Exposition opens at Cleveland's Public Hall. Can't you just see the steel, brass, bronze, tin, titanium and zirconium boys running around, stealing each other's Selector? It promises to be so exciting we can scarcely wait to attend the show. Incidentally, if you find that some light fingered metallurgist has lifted your Metal Selector, you may pick up a new one at STEEL's booth.

Why we should leap from the Metal Show to Charlsie Vunovic, secretary, General Steel Castings Corp., Granite City, Ill., is a matter of no wonderment: The comparative charms of a Metal Show and a Charlsie are too obvious. Miss Vunovic writes her disagreement with Miss Fricke (STEEL, Sept. 6, this page), who decries the use of scantily clad ladies to promote such things as blowtorches, molding sand and automation. Charlsie likes them; claims her girl friends do, too. "After we take a good look," she writes, "we promptly go on a brand new diet."

This inside information should be of incalculable value to advertising managers who are in the process of cooking up new advertising campaigns. It should interest our own Harold G. Rowland, STEEL's advertising director, too, because Charlsie adds: "Most females choose Behind The Scenes as their favorite page, especially those like me, whose only contact with the magazine is to pass it on with the rest of the mail."

What do you have to say about that, Mr. Rowland?

Shrdlu

(Metalworking Outlook—Page 107)

THEY "SKIN" STEEL TUBES to put PEP in this DIESEL!

Courtesy: Van der Horst Corp. of America

This powerful diesel loses its pep when cylinder liners become excessively worn. Formerly, this reoccurring ailment called for reboring — an operation that reduced the liner wall and its mechanical strength. In time, costly castings had to be scrapped. Now — a unique application of Frasse tubing helps put them back in service . . . indefinitely! Here's how.

By means of a newly developed electrolytic bath, the bore of the worn liner is plated with a precise layer of pure iron etched from the surface of a steel tube. It is then restored to original size — ready for service again.

The success of this precision plating operation depends on quality tubing that is dimensionally uniform. Frasse tubing — from warehouse stock — has met this rigid requirement for many years *without a single rejection.*

There is no fear of non-uniformity when you work with Frasse tubing. You get the same trouble-free quality with every order. And, remember Frasse tubing specialists are available to consult with you in applying tubing to your product advantageously, or in solving a tube problem. Whenever you need tubing — you'll be pleased with the extra services you get — simply by calling Frasse.

Frasse for Tubing....

Seamless and Welded Mechanical Tubing
Pressure, Condenser and Hydraulic Tubes
Stainless Tubing, Seamless and Welded
Stainless Pipe, Valves and Fittings
Aluminum Tubing, Pipe and Fittings
PVC Plastic Pipe, Valves and Fittings

Peter A. Frasse & Co., Inc.

NEW YORK 13, N.Y.	PHILADELPHIA 29, PA.	BUFFALO 7, N.Y.	SYRACUSE 1, N.Y.	HARTFORD 1, CONN.
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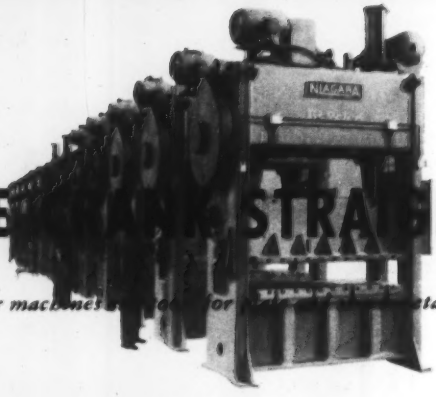
WAlker 5-2200	BAldwin 9-9900	BEdford 4700	SYracuse 73-5241	CHapel 6-8835

LYNDHURST • ROCHESTER • BALTIMORE

"we concentrate on Niagara

NIAGARA **DOUBLE ... STRAIGHT**



America's most complete line of presses, press brakes, shears, other machines ... for ... tal work

presses...

In-line operation of four Niagara Series SC-2 Presses, engaged in progressive production of automotive side moldings from .025" #430 stainless steel.

Press operator shows a blank and formed molding which will grace one of the "Big Three" cars.

SIDE PRESSES

...they require a minimum of maintenance"

Producing up to 1,750,000 automotive moldings per month, these four Niagara Double Crank Straight Side Presses do the work of eight for a large Midwestern metal stamping firm. Their long beds enable the outfitting of each press with two sets of dies for two separate operations.

"We believe in standardizing. That is why we concentrate on Niagara Presses. They require a minimum of maintenance. When jobs come in, we are sure we can get them out. They are a volume machine," says the vice president and plant superintendent.

. . . and with good reasons, this famed line of Niagara presses requires a minimum of maintenance:

- *Rugged, integral, all-welded steel frames of exclusive triple box section design properly resist deflection to assure greater accuracy and longer die life.*
- *Laminated non-metallic ways of box type welded steel slides are a positive safeguard against scoring and assure trouble-free service.*
- *Low inertia pneumatic friction clutch reduces heat and wear. Only the shaft and driving plate are started and stopped at each cycle. Most of the clutch weight continues to rotate with the flywheel.*
- *Outboard mounting of clutch makes it accessible for easy maintenance . . . without disturbing any drive or crown parts.*
- *No adjustment for wear of clutch plate is necessary. It is self-compensating.*
- *Clutch linings are cycle-welded to plate, without rivets, increasing effective life.*
- *Brake shoes are full floating and self-aligning . . . cannot cock, bind or wear unevenly.*
- *Steel gears run in totally enclosed oil baths. Centralized pressure lubrication sends vital oil to journals, ways and wherever necessary for long efficient, service life.*

Like this well known metal fabricator, it will be profitable for you, also, to consider standardizing on Niagara presses. First of all, Niagara has the most to offer . . . straight side double crank, single crank and eccentric geared, open back inclinables and dozens of others. Secondly, in the words of the same company's purchasing agent: "The prices on Niagara Presses are right . . . and they do the job."

Built in 50 through 400-ton capacities, Niagara Double Crank Straight Side Presses are readily equipped with automatic feeds, variable speed drives, iron hands and other automatic materials handling devices so popular with the automotive and appliance industries. Post yourself on this important line by requesting Bulletin 64.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

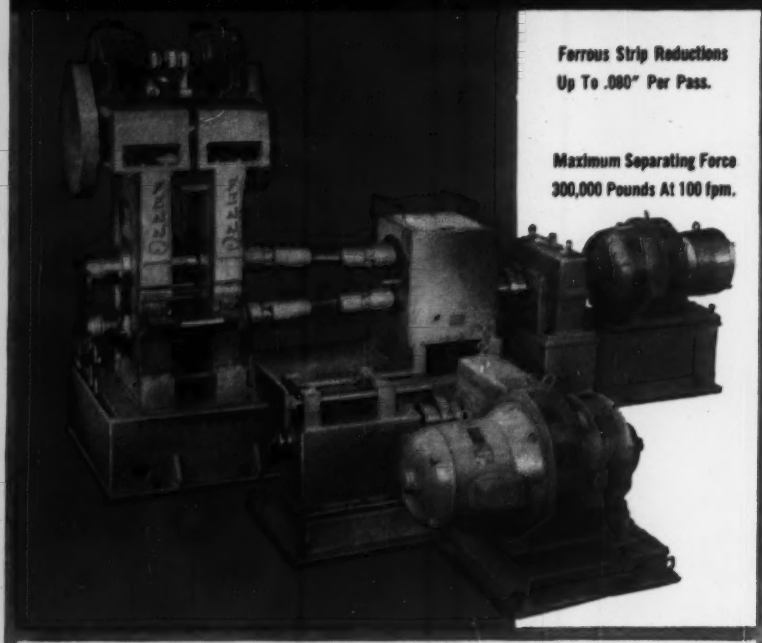
Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

FENN INTRODUCES A . . .

NEW LARGE

LABORATORY ROLLING MILL



Ferrous Strip Reductions Up To .080" Per Pass.

Maximum Separating Force 300,000 Pounds At 100 fpm.

PERMITS HEAVY REDUCTIONS IN THE LABORATORY ON FERROUS STRIP

Fenn's new Model 4-083 Combination Type Laboratory Rolling Mill, a companion to the popular smaller Fenn Mill, is capable of taking heavy reductions on ferrous strip at all speeds between 100 fpm and 500 fpm. The mill (2½" x 8⅜" x 8") can be used as a two-high mill, or as a four-high mill featuring driven back-up rolls or work rolls, and many drive combinations are possible to meet customer specifications. Important features of the new mill include a dual motor power screw-down unit, force feed lubrication system, and auxiliary operator control stations.

FENN

COMPLETE MILL SPECIFICATIONS sent upon request

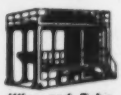
Fenn engineering service is available to help you solve your rolling problems.

Precision Rolling Mills

Turks Heads

Wire Shaping Mills

Swaging Machines



Wire and Tube Drawing Machines

THE FENN MANUFACTURING COMPANY, 404 FENN ROAD, NEWINGTON, CONNECTICUT

LETTERS TO THE EDITORS

Problem for Thoughtful People

I recently received a copy of your editorial, "Is Bigness Bad?" (Aug. 27, page 45).

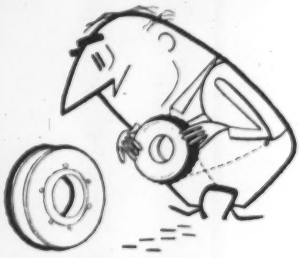
I agree with you in part, that it is unfortunate to make a problem, such as the size of business—a political football. On the other hand, it seems to me that the size of business is becoming a problem which cannot be shrugged off by thoughtful people. I am coming to the opinion that for business apologists to continually recite the sum of stockholders in a large company is also, to use your own words, a tired old chestnut.

The fact, for example, that Ford Motor Co. suddenly has thousands of stockholders, has not affected the manner in which it does business in any way.

We are living in an era of professional management, where control and ownership are not synonymous, as they formerly were; and the spread of ownership has little to do with the management of the business, assuming the business is profitable.

Elbert M. Gage
President
Teer, Wickwire & Co.
Jackson, Mich.

Smallness: A Big Problem



Your article, "Small Wheels Big Headaches" (Sept. 3, page 57), was read with interest.

I'm curious as to why passenger car manufacturers do not adopt disc brakes, which, we understand, eliminate the fade, one of the drawbacks of present designs.

Frank I. Webster
Purchasing Agent
Gemmer Mfg. Co.
Division of Ross Gear & Tool Co. Inc.
Detroit

• *While disc brakes undoubtedly provide a better means of stopping our heavier and faster cars, the big reason auto makers don't use them is that they cost too much.*

Despite claims of economy production, it still costs about $300 to produce and install a set of these brakes—almost double the cost of standard shoe brakes.

Facts for Senate Study

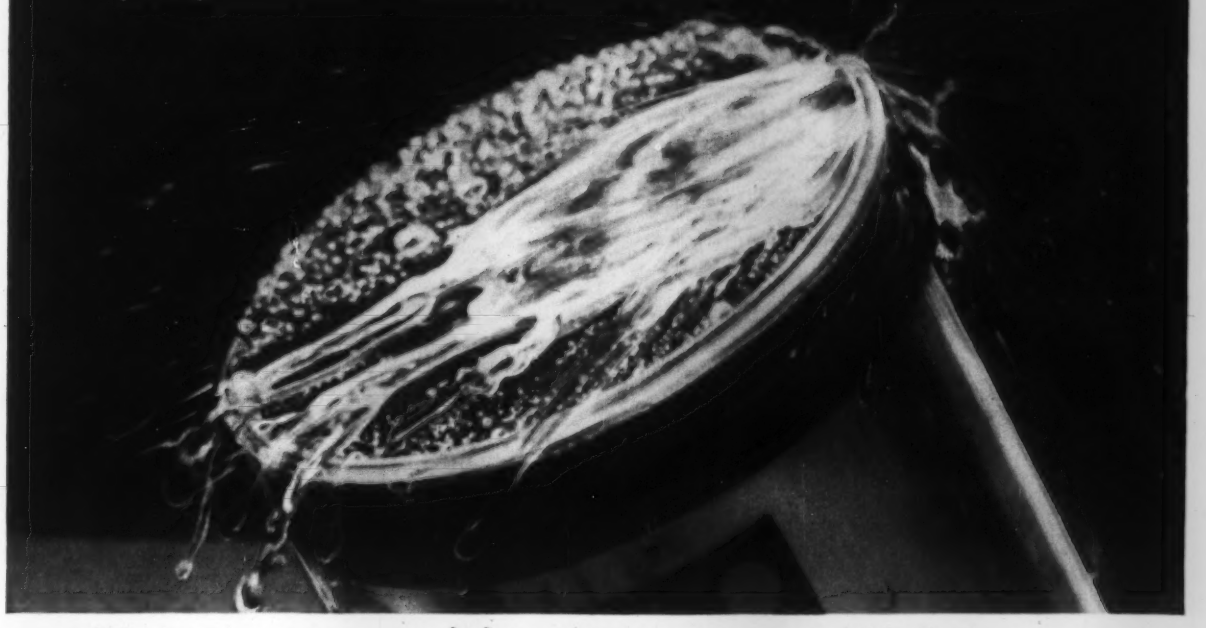
In connection with a study I am preparing for the U.S. Senate Small Business Committee, I should like information on these questions: 1. What is the address of the American Steel Warehouse Association? 2. What is the

(Please turn to page 12)

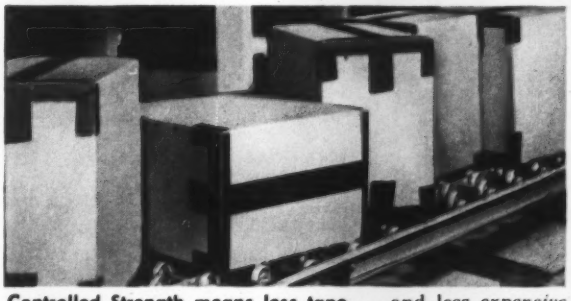
Proof that Polyken Tapes have

CONTROLLED STRENGTH

(the right combination of backing and adhesive to give you "all work—no waste")



Water-proven . . . and they save you money with their "just right" ability to stick, seal, hold and protect



Controlled Strength means less tape . . . and less *expensive* tape . . . for assembly-line packaging. *Polyken* Waterproofs lick the cost problem . . . provide vital protection against careless handling and exposure.

Controlled Strength protects contents from moisture and air. In this case, ink cans are sealed with a high-quality *Polyken* tape that grasps quickly and firmly, yet pulls off without a struggle.

Polyken®

CONTROLLED STRENGTH

INDUSTRIAL TAPES

THE KENDALL COMPANY, POLYKEN SALES DIVISION

MAIL THIS COUPON NOW!

Polyken, Dept. S-J,
309 W. Jackson Blvd., Chicago 6, Illinois

Please send me your latest sample and data file on the complete line of Polyken Waterproof Tapes with "Controlled Strength."

Name _____ Title _____

Company _____

Street Address _____

City _____ Zone ____ State _____

Flexible, fast and safe, Coles mobile cranes can do more jobs better for less

Coles works closer to stacks for accurate spotting, maximum SELECTIVITY

COLES CRANES

JOLIET 7, ILLINOIS

Write for booklet "101 COST-CUTTING WAYS"

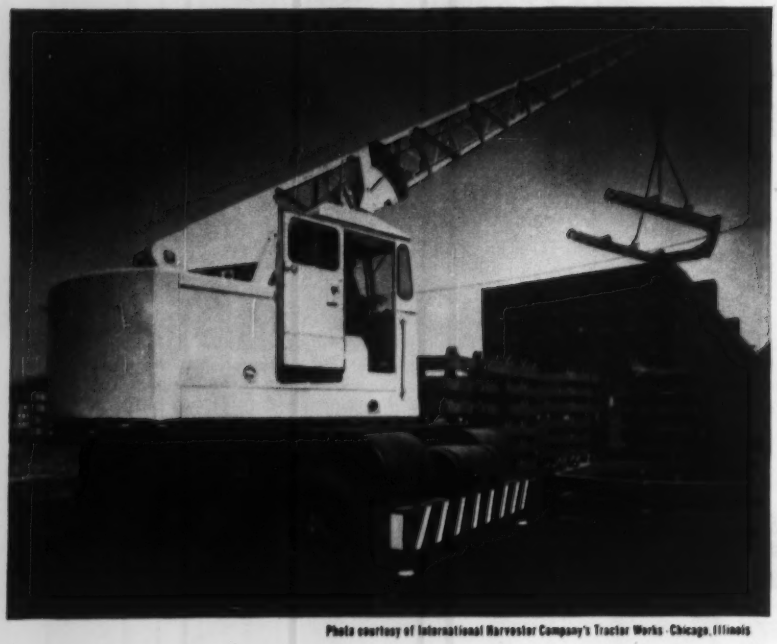


Photo courtesy of International Harvester Company's Tractor Works · Chicago, Illinois

Now, available L.P.G.- diesel- or gasoline-electric powered in capacities from 2 to 15 tons. Available on long term lease arrangement, too.

LETTERS

(Concluded from page 10)

source for your prices on "Imported Steels" as shown on page 169 of your Aug. 20 issue?

We are comparing prices per 100 pounds (duty paid) on various foreign steel items with comparable domestic ones.

Vernon A. Mund
Economic Consultant
Select Committee on Small Business
U.S. Senate
Washington

• *The address of the American Steel Warehouse Association Inc. is Terminal Tower, Cleveland 13, O.*

Our New York office, headed by B. K. Price, is the source for our prices on imported steel. The office checks various importers each week to get current prices.

Steel Expansion Scoreboard

We would appreciate three copies each of the articles, "Steel Expansion Rolls Along" (page 134) and "Steelmaking: Portrait of Tomorrow" (page 137), appearing in your Sept. 17 issue.

T. F. Olt
Director
Research Division
Armco Steel Corp.
Middletown, O.

Search for Missing Article

In the May 7 issue, there was an interesting article on where to look for technicians and the uses of professional talent for jobs in industry. Somehow this issue was mislaid or lost before I could save the article.

A recent development would make reference to this article most timely.

I would appreciate three reprints if they are still available.

D. W. Moser
Principal
School of Shop Practice
International Correspondence Schools
Scranton, Pa.

• *We are forwarding reprints of the article, "Extra Hands for Engineers" (page 53).*

Reader Gets Wanted Data

Thank you for the article, "Betting on Copper in Peru" (Aug. 27, page 52), which tells about the Southern Peru Copper Corp. It is exactly what I have been wanting and, by far, the most authoritative information I have had. I am grateful to STEEL.

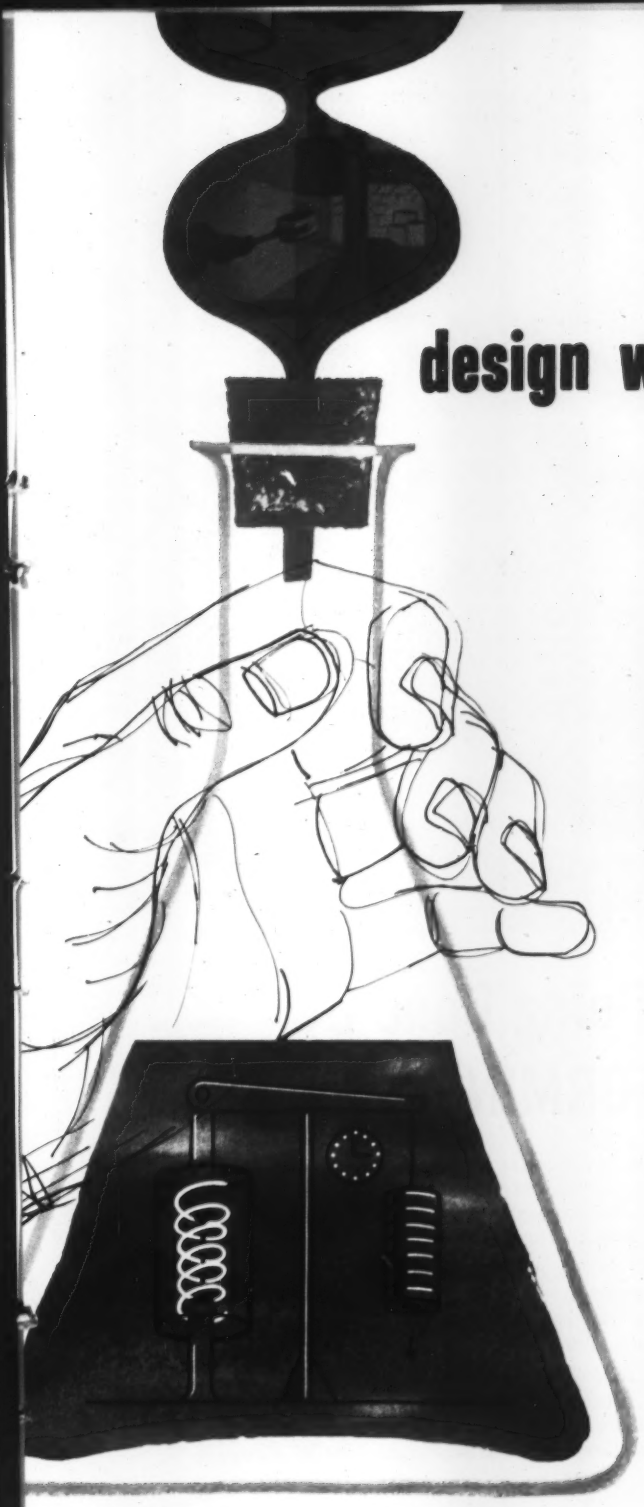
Robert Wells
Great Falls, Mont.

Torque Measurement

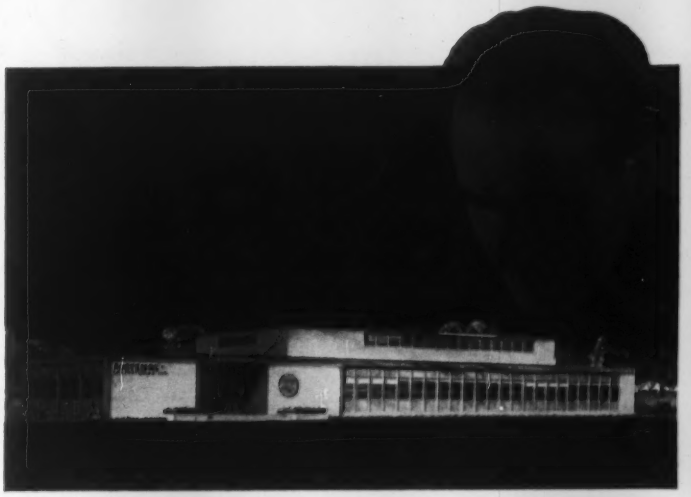
In the Aug. 20 isue, the item "Gage for Torque," in the Technical Outlook column (page 115) described a new gage for torque. Strain is measured electrically, the dial indicating torques up to 1250 inch-pounds. We are interested in obtaining more detailed information from the manufacturer.

John Schumann
Metal Tester
Engineering Laboratory
Leviton Mfg. Co.
Brooklyn, N. Y.

• *Write to the Electronics & Instrumentation Division, Baldwin-Lima-Hamilton Corp., 806 Massachusetts Ave., Cambridge 39, Mass.*



design with austenal in mind



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A new facility for advanced research is now under construction at Austenal to broaden the many applications of Microcast—to make new methods and alloys available, and to allow greater freedom and latitude in part designing.

One section of this new plant will contain the equipment familiar to the investment casting industry and in addition, equipment necessary for investigating numerous other methods of making and treating castings. Adjoining the foundry area will be shops for pilot line and experimental work in mold making, waxing, investing and finishing. There will be an area containing laboratories for mechanical testing, physical testing, metallographic investigations, refractories development and chemical investigations.

Contact your Austenal engineer today and ask him to show you how Austenal's continuing program of research and development will help you design greater performance and reliability into the investment castings you require.

It's **NEW** *from Austenal*

"Design with Microcast in Mind," Austenal's new informative booklet, tells you how to get the greatest benefit from Microcast, showing the great latitude of design possibilities, alloys available and a great deal more, valuable information. Write for it today.

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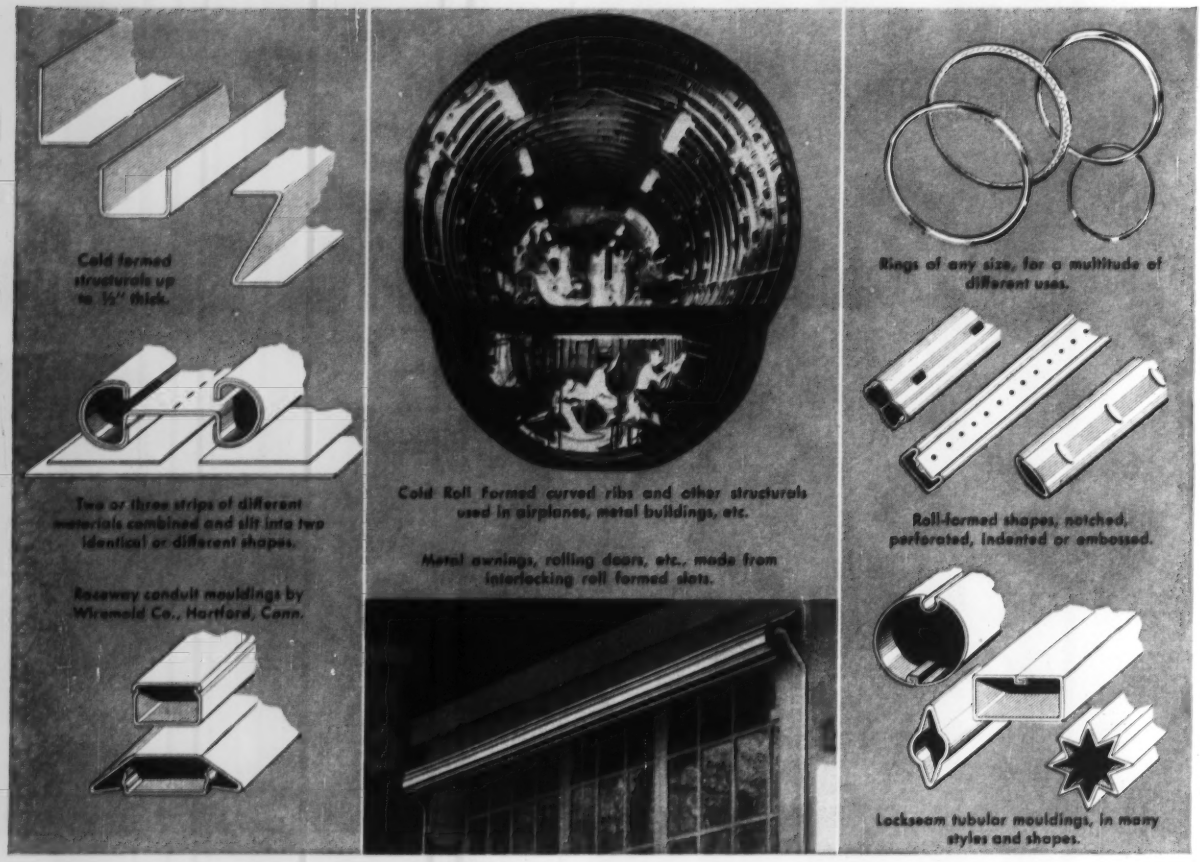
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Two or three strips of different materials combined and slit into two identical or different shapes.
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Cold Roll Formed curved ribs and other structurals used in airplanes, metal buildings, etc.
Metal awnings, rolling doors, etc., made from interlocking roll formed slats.
Rings of any size, for a multitude of different uses.
Roll-formed shapes, notched, perforated, indented or embossed.
Lockseam tubular mouldings, in many styles and shapes.

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● The basic function of a Yoder cold roll forming machine is, of course, to convert flat rolled strip or sheets at high speed into mouldings, panels, tubular, channel and other shapes.

Quite often, these shapes need further elaboration before being ready for assembly or installation. They may, for instance, have to be curved, coiled or made into rings. Or they may need to be perforated at certain intervals of spacing, notched, embossed, or otherwise finished by additional operations. You may want to combine two or more materials into a finished shape, such as carbon steel with stainless, felt, wood, etc.

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CALENDAR
OF MEETINGS

Oct. 1-3, National Electronics Conference Inc.: Annual meeting and exhibit, Sherman hotel, Chicago. Conference's address: 84 E. Randolph St., Chicago 1, Ill. Executive secretary: John S. Powers.

Oct. 1-4, American Mining Congress: Metal mining and industrial minerals convention and exposition, Shrine Auditorium and Exposition Hall, Los Angeles. Congress' address: 1102 Ring Bldg., Washington 6, D. C. Executive vice president and secretary: Julian D. Conover.

Oct. 1-5, American Institute of Electrical Engineers: Fall general meeting, Morrison hotel, Chicago. Institute's address: 33 W. 39th St., New York 18, N. Y. Secretary: N. S. Hibshman.

Oct. 2-4, Air Moving & Conditioning Association Inc.: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: 2159 Guardian Bldg., Detroit 26, Mich. Executive vice president: L. O. Monroe.

Oct. 2-6, Society of Automotive Engineers Inc.: National aeronautic meeting, aircraft production forum and aircraft engineering display, Hotel Statler, Los Angeles, Calif. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: John A. C. Warner.

Oct. 4-5, Magnesium Association: Annual meeting, Drake hotel, Chicago. Association's address: 122 E. 42nd St., New York 17, N. Y. Secretary: Jerry Singleton.

Oct. 8-10, American Society of Mechanical Engineers: Lubrication conference, Chalfonte-Haddon Hall, Atlantic City, N. J. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: C. E. Davies.

Oct. 8-10, Institute of Metals Division, American Institute of Mining, Metallurgical & Petroleum Engineers Inc.: Fall meeting, Hotel Carter, Cleveland. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: Ernest Kirkendall.

Oct. 8-11, Society for Non-Destructive Testing: Fall technical meeting, Hollenden hotel, Cleveland. Society's address: 1109 Hinmann Ave., Evanston, Ill. Secretary: Philip D. Johnson.

Oct. 9, Industrial Heating Equipment Association: Fall technical meeting, Hotel Statler, Cleveland. Association's address: 412 Fifth St. N.W., Washington 1, D. C. Executive vice president: Carl L. Ipsen.

Oct. 8-12, American Society for Metals: Annual meeting, Hotel Statler, Cleveland. Society's address: 7301 Euclid Ave., Cleveland 3, O. Secretary: W. H. Eisenman.

Oct. 8-12, American Welding Society Inc.: National fall technical meeting, Cleveland hotel, Cleveland. Society's address: 33 W. 39th St., New York 18, N. Y.

Oct. 8-12, National Metal Congress & Exposition: Public Auditorium, Cleveland. Information: American Society for Metals, 7301 Euclid Ave., Cleveland 3, O. Secretary: W. H. Eisenman.

Oct. 10-12, Material Handling Institute: Fall meeting, Traymore hotel, Atlantic City, N.J. Institute's address: One Gateway Center, Pittsburgh 22, Pa. Managing director: R. Kennedy Hanson.

Oct. 10-12, Society of Automotive Engineers Inc.: National transportation meeting, Hotel New Yorker, New York. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: John A. C. Warner.

Oct. 11-12, National Foundry Association: Annual meeting, Sheraton-Cadillac hotel, Detroit. Association's address: 53 W. Jackson Blvd., Chicago 4, Ill. Executive secretary: C. T. Sheeham.

Rx for casting headaches*

Finding the proper castings often causes headaches for the purchasing, production and design men. Many have found the remedy in HAMILTON QUALITY CASTINGS.®

There are differences between foundries, and the differences can be important to you. Hamilton Foundry excels in the problem jobs . . . in castings that are hard to make because of intricate coring, thin metal sections, tight dimensional tolerances or high physical specifications. We take these jobs and consistently "make them right" . . . on time.

Our specialties are light and medium castings in Gray Iron, Alloyed Iron, Meehanite, Ni-Resist and Ni-Hard.

Why not let us relieve your casting headaches?

* HAMILTON QUALITY CASTINGS® H®

A 'phone call or letter will bring prompt assistance. Better still, send us the drawing with casting weight and a description of the pattern equipment. We'll be glad to prescribe for that "casting headache"

P.S. The above "headache casting", a pump body, was made in Meehanite; casting weight 3.87 lbs. Cored passages and sections ranging from 11/32" to 2 1/16" made this casting a tough one.

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M86-2

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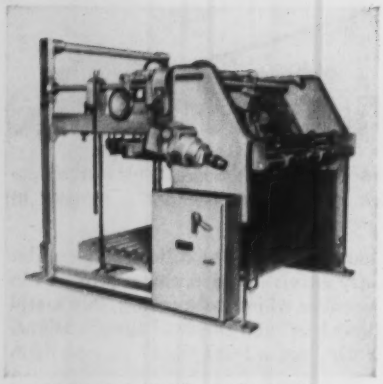
AUTOMATIC METAL SHEET FEEDER

Metal sheets, automatically separated, picked up and advanced one at a time to feeding—in point of machine to which it is attached at speeds up to 150 sheets per minute.

Should two sheets adhere, they are automatically transferred to a reject tray. Rubber suction mouthpieces and drop rollers prevent scratching.

Standard Feeder handles metal sheets from 14" x 18" up to 36" x 44" between 24 and 38 gauge stock. Feeders for larger size and heavier gauge metal sheets also available.



Continuous reloading avoids machine stoppage. New loads are placed in feeding position, while machine is operating, thus maintaining continuous automation cycle.

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Copperweld is the steel with "built-in productivity."

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ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

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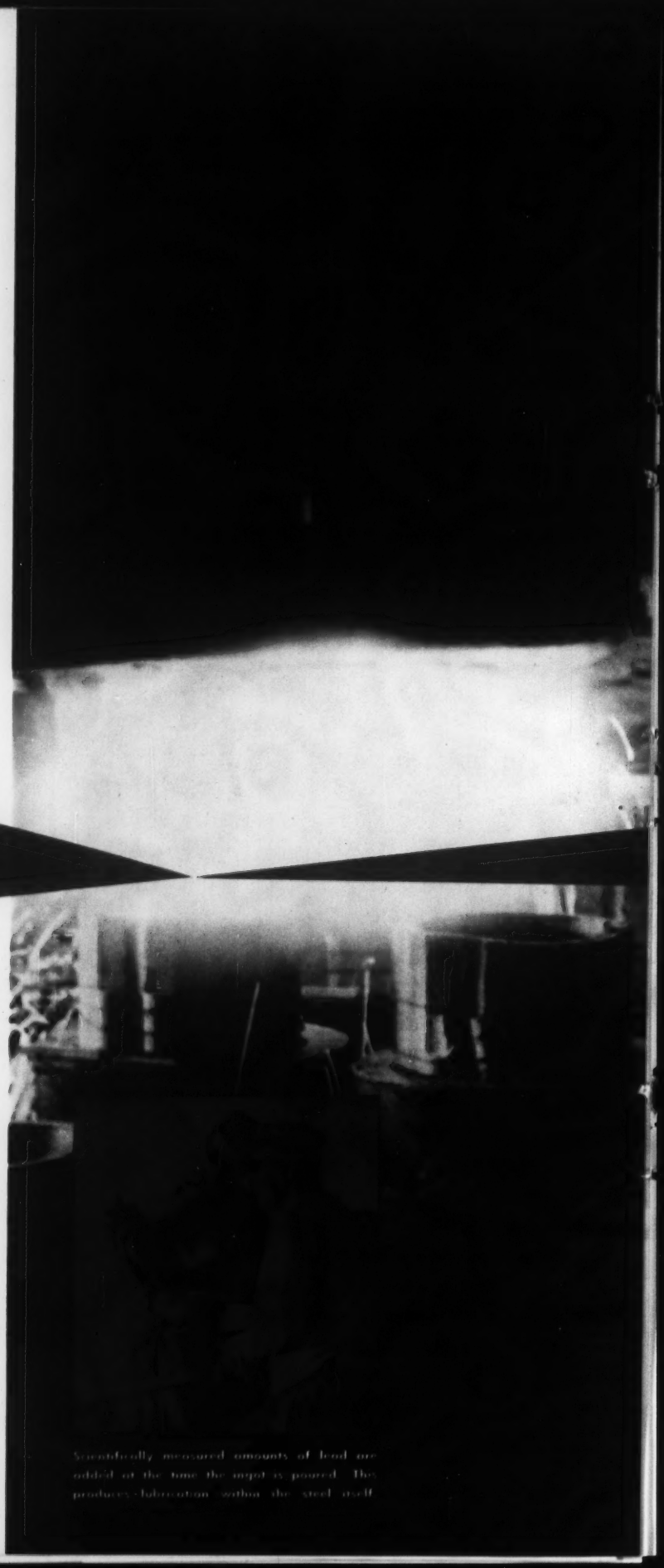


Scientifically measured amounts of lead are added at the time the ingot is poured. This produces lubrication within the steel itself.

SPUR GEAR

The facts speak for themselves—by switching to Aristoloy 4140 Leaded, machining time was cut 1/3, and finish was greatly improved.

	AISI 4140	AISI 4140 LEADED
Machine Speed R.P.M.	90	128
Feed Inch/Rev.	.007	.010
Cycle Time	6' 15"	4'
Finish	Fair	Excellent

SPIRAL GEAR

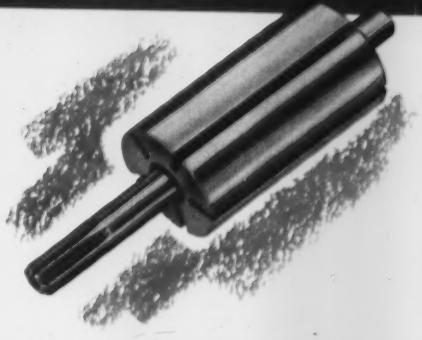
Machinability was increased 25% when Aristoloy 4140 Leaded was substituted for non-leaded AISI equivalent. The most important savings from a cost standpoint, however, was a 75% improvement in tool life. In contrast with the 6 to 8 gears per tool grind formerly obtained with non-leaded steel, the manufacturer of these gears for agricultural equipment now gets 11 to 14 pieces per grind. Finish was so much improved that the noise factor of this gear in operation was completely eliminated.

COPPERWELD LEADED STEELS

Save Money 4 Ways

ROTOR

Through use of a leaded steel, automatic screw machine production was upped 25%. Saw blade life (used in sawing radial slots) increased from 18 pieces to 60 pieces—a remarkable improvement representing a considerable savings in production costs. It should also be added that saw breakage—a previous problem—was completely eliminated when this manufacturer of pneumatic impact wrenches specified Aristoloy 8620 Leaded instead of AISI 8620 non-leaded.



BALL STUD

Use of 8640 Leaded improved automatic screw machine production nearly 40% for this large job shop.

	A-8640	8640 LEADED
Machine Speed, S.F.M.	107	154
Spindle Speeds, R.P.M.	345	495
Machine Cycle Seconds	26.3	19.1
Production per machine hour	108	150
Finish	Fair	Excellent

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Electric arc furnaces represent the greatest degree of refinement of any steel-producing method. The more rigid metallurgical control possible in the electric furnace assures the highest, most uniform quality in every heat. The versatility of the electric furnace makes possible the production of many steels required to serve a diversified market. The electric furnace has made the Copperweld trademark a symbol of the finest steels you can buy.

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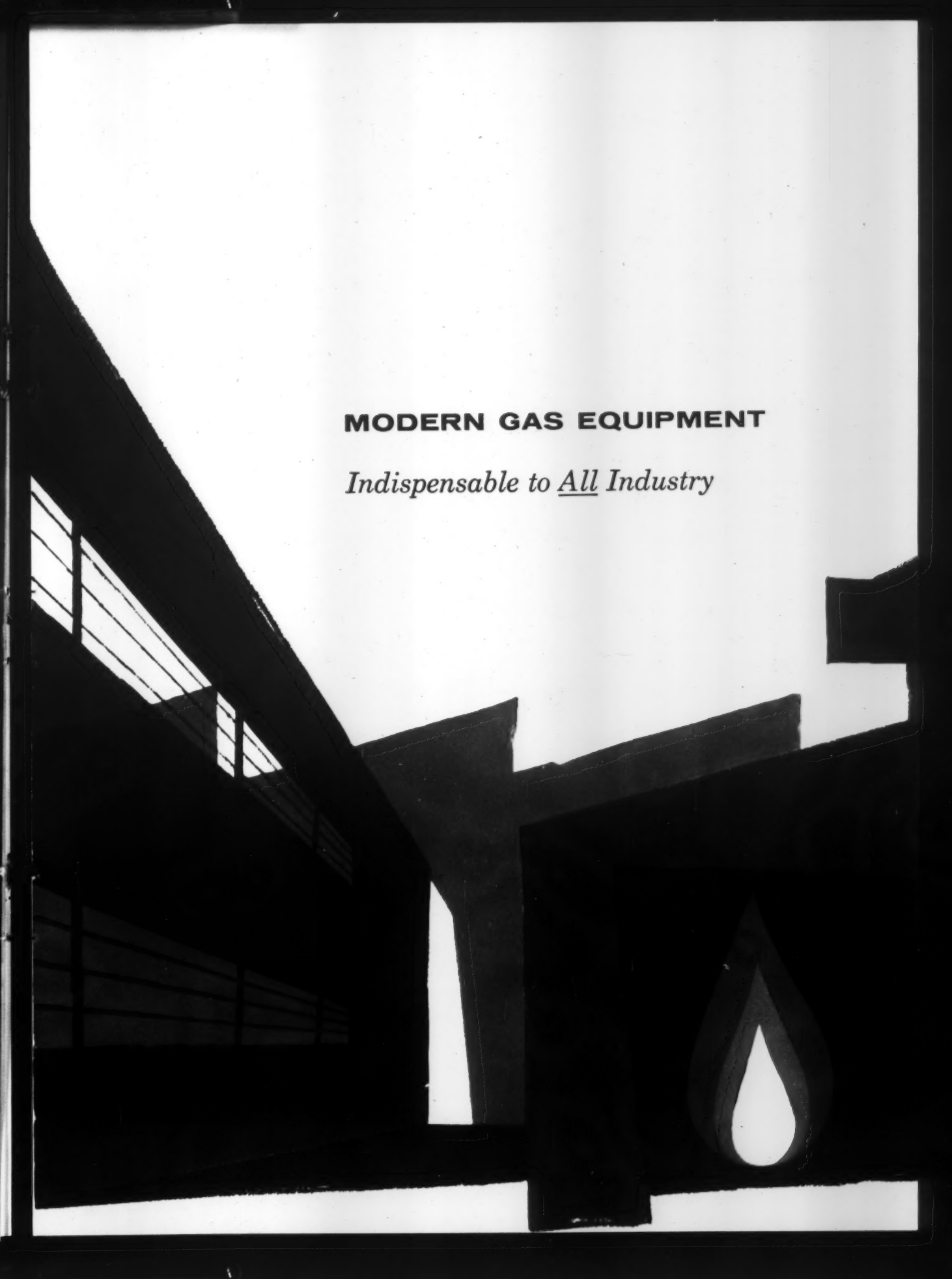
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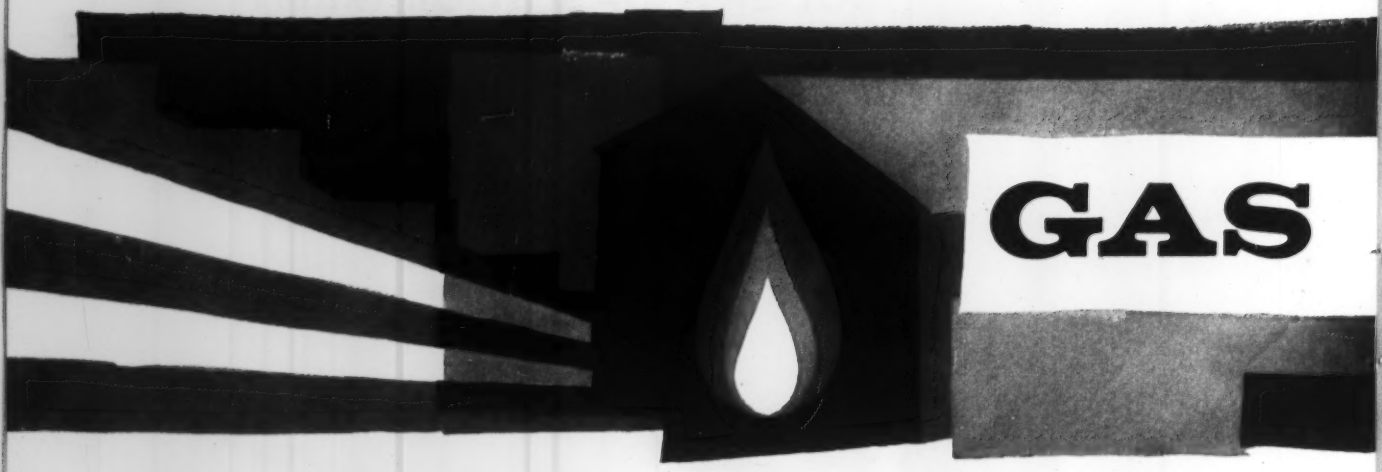

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STEEL BILLETS, up to 7" square, are heated in this Selas Gradiation furnace at Lansdowne Steel and Iron Company. Fast heating to 1850°F . . . at rates of 2 to 5 minutes per inch of thickness . . . virtually eliminates scale, thereby reducing billet weight 10%. Fast heated billets are forged at temperatures 300°F below conventional methods.

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Whether your forging requirements call for fully automatic or manual handling operations, you always get these benefits from Selas Gradiation heating: rapid start-up . . . low cost per work-piece heated . . . virtual elimination of scale . . . precise controllability . . . ***FAST*** heating which helps pace production . . . compact equipment which reduces floor space requirements.

In heat treating, brazing, forging, strip-heating and other continuous operations involving both ferrous and nonferrous metals, Selas engineers can design Gradiation heating to help speed production, improve product quality, reduce costs.

Our engineers will be glad to discuss how Selas Gradiation methods can be tailored to your heating needs. Address Dept. 210.

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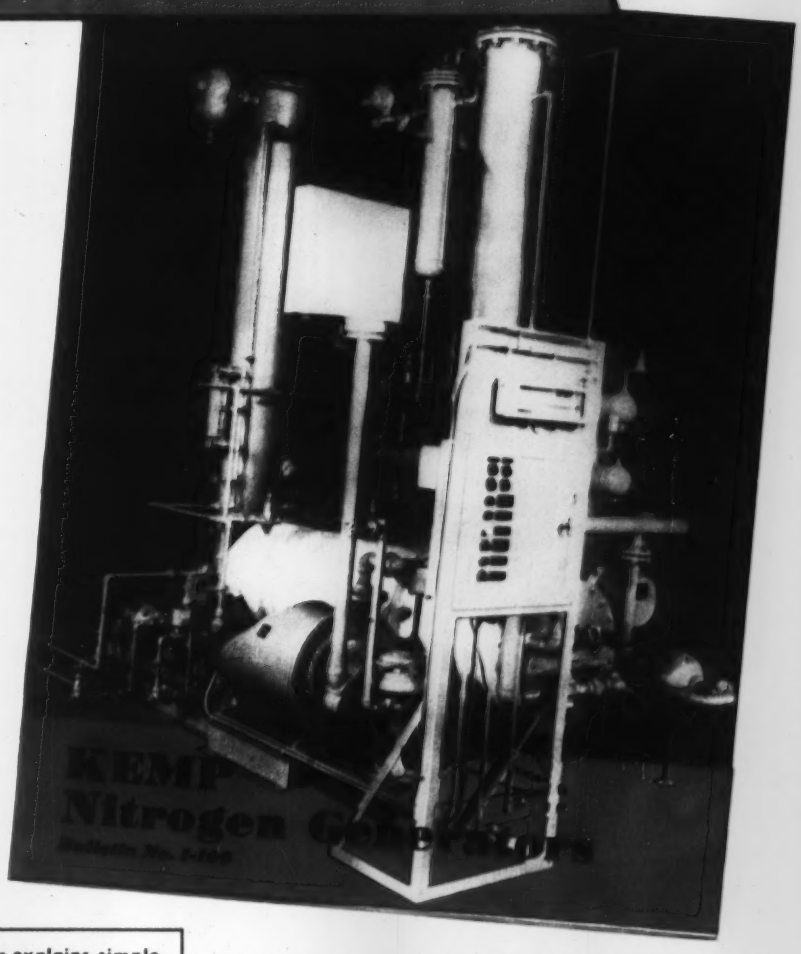
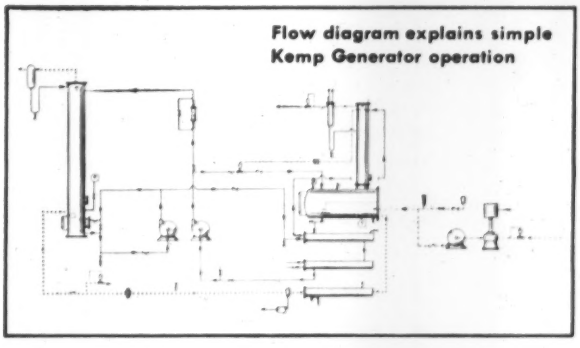
If you use Nitrogen as a Protective Atmosphere in Heat Treating . . .

this *NEW* Bulletin shows how KEMP N_2 Generators slash operating costs, increase quality!





Flow diagram explains simple Kemp Generator operation

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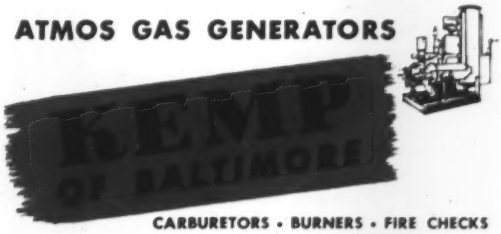
Bulletin contains complete operation procedure, design features, composition chart, data chart and a detailed flow diagram. In addition, you receive an inquiry data sheet that you may fill in and send to Kemp, at no cost to you, for a free evaluation.

Also available at no cost to you, the Kemp Inert Gas Generator Bulletin No. I-10. Check below for the bulletin(s) you would like sent to you.

ATMOS GAS GENERATORS



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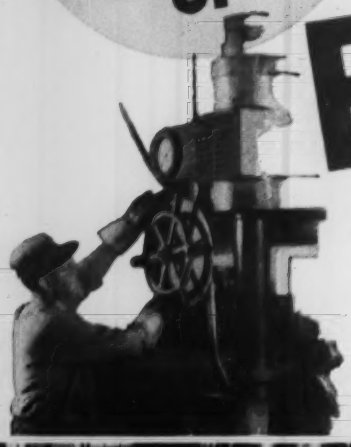
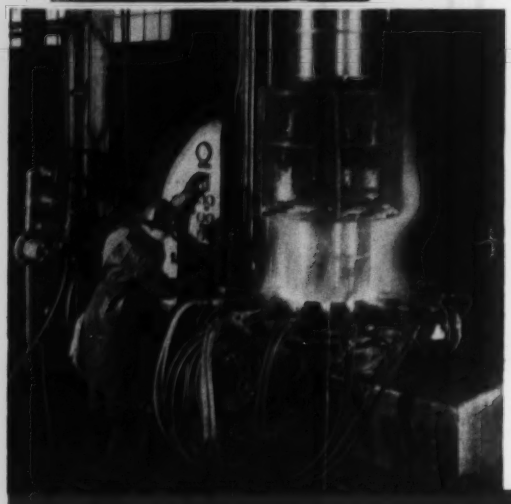
YOU CAN'T BEAT THE COMBINATION OF SKILLS and EQUIPMENT



...which ONLY the Commercial Heat Treater can provide



Today's modern commercial heat treating plant might well be described as a "department store" for metal treating services. For under one roof are offered you not only the full range of heat treating equipment for all types of processes . . . but . . . of still greater importance, the manpower skills of the management and technicians of those supervising and performing your jobs. *Service* is their keynote.

Whatever your needs . . . whenever you need it . . .

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Kenosha, Manitowoc, Port Washington, Racine, Wisc.

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Benedict-Miller, Inc.
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Bennett Heat Treating Co., Inc.
Newark 3, New Jersey

Commercial Metal Treating, Inc.
Bridgeport, Conn.

Cook Heat Treating Co. of Texas
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The Dayton Forging & Heat Treating Co.
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Deminy Heat Treating Corp.
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Drever Company
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Greenman Steel Treating Company
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Alfred Heller Heat Treating Co.
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Metallurgical, Inc.
Minneapolis 14, Minnesota

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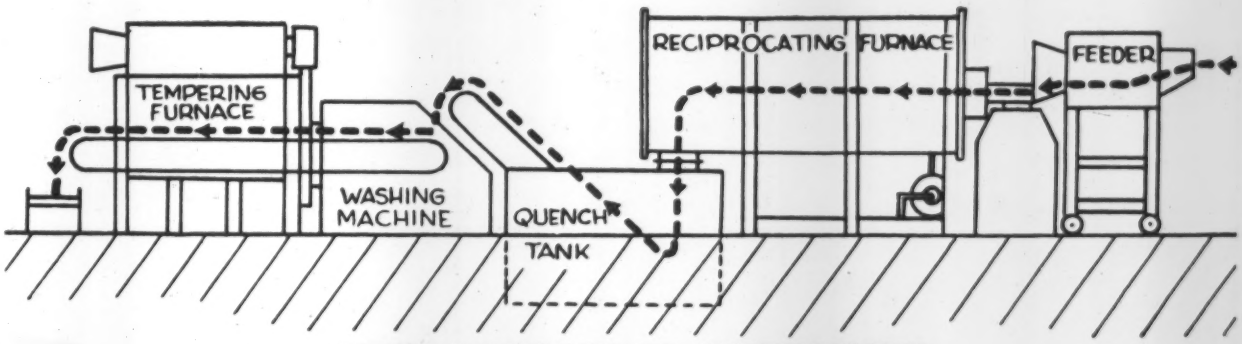

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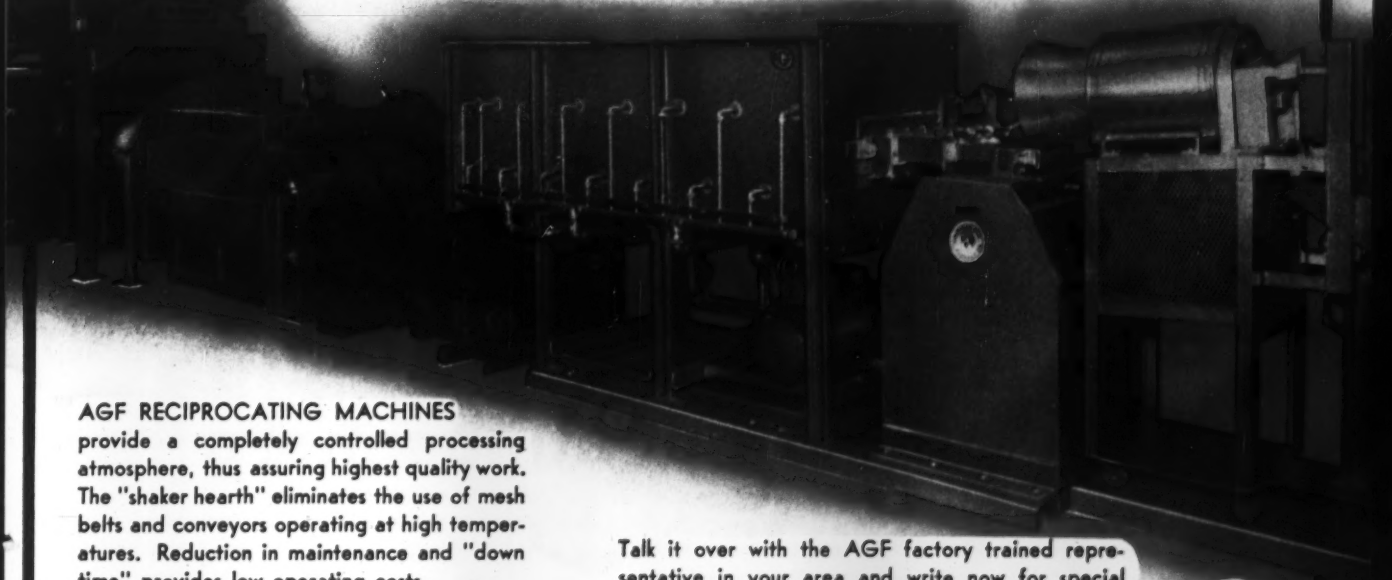
COMPLETE Installations to handle your product from 100 to 800 lbs. per hour of work ranging from pen points to hammer heads . . . Incorporating the versatility and uniformly individualized treatment possible only in the new PATENTED Series 200 RECIPROCATING MACHINES.



AGF RECIPROCATING MACHINES provide a completely controlled processing atmosphere, thus assuring highest quality work. The "shaker hearth" eliminates the use of mesh belts and conveyors operating at high temperatures. Reduction in maintenance and "down time" provides low operating costs.

AGF Engineers and Metallurgists are ready to take complete charge of your installation *with a guarantee of definite results.*

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Talk it over with the AGF factory trained representative in your area and write now for special material illustrating and describing how your AUTOMATIC HEAT TREATING can be accomplished for your present and future production requirement.

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Please send ☐ Literature-Automatic Heat Treating ☐ Representative

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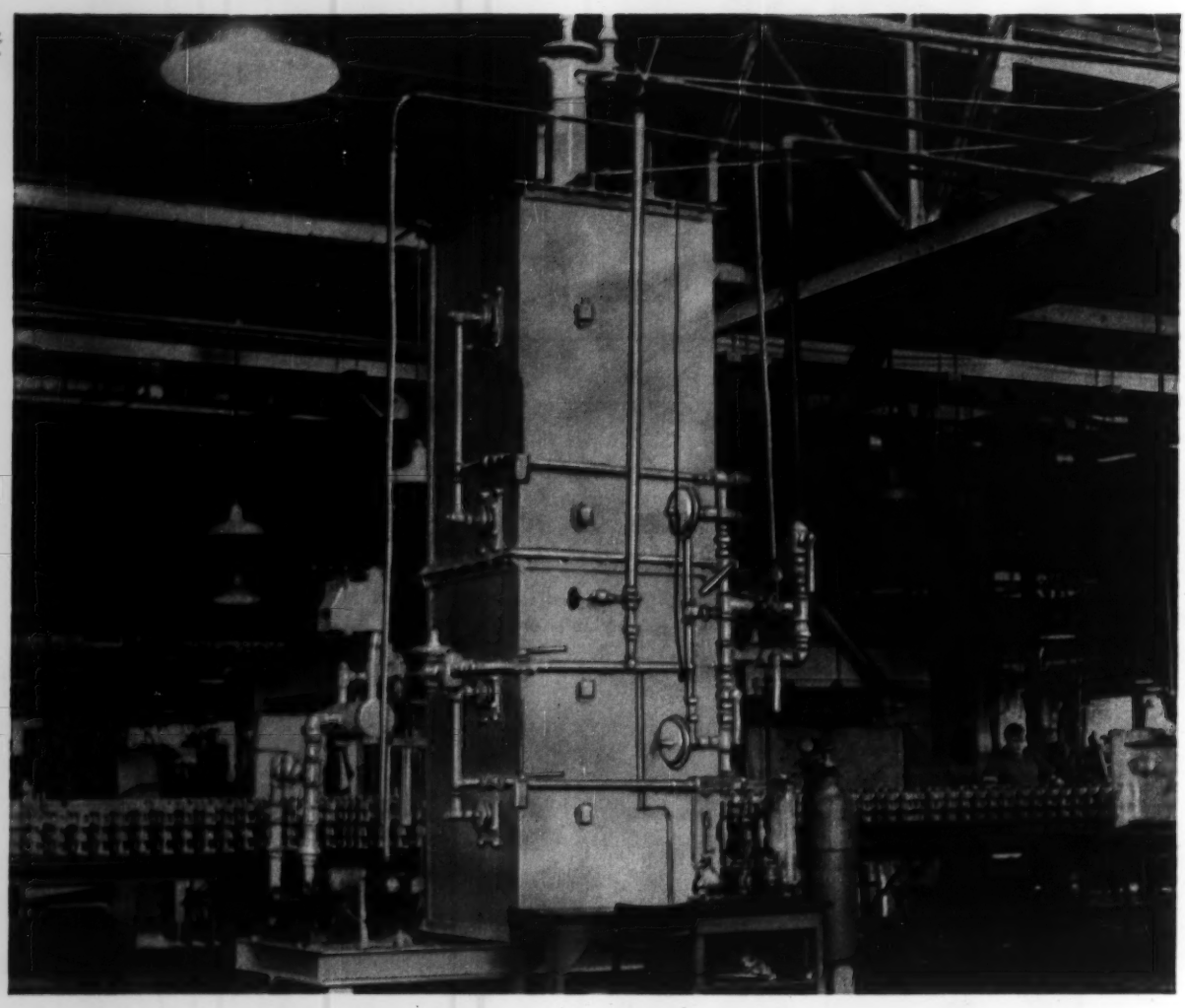

1,500,000 cfh of atmosphere

That's the combined capacity of all the Surface RX® gas generators sold since this first one started operating April 4, 1941. This was the first practical catalytic gas generator for continuous bright gas carburizing . . . and it's still in use at Warner Gear Division, Borg-Warner Corp.

Such long-term reliability is only one of the reasons why so many plants standardize on Surface gas generators. Controllability, flexibility, turn-down operation, variety of gases and capacities are some of the other reasons. We'll be happy to tell you more about them.

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Surface® Heat Treat, Steel Mill, Glass Divisions • Kathabar® Air Conditioning Division
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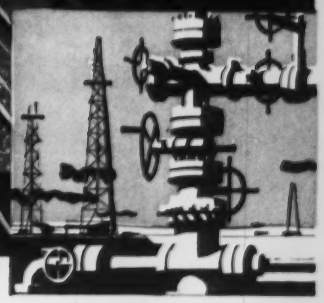
Surface
HEAT TREATING EQUIPMENT



J&L Steel pipe serves the gas industry in the field . . . and in your home.

perfect...as usual

thanks to steel pipe and gas

Consider, for a moment, the gas heat that brings this roast beef to its flavor peak.

How does such a remote commodity as natural gas, buried deep beneath the earth, flow freely—at a finger's touch—into the preparation of this delicious meal?

One good answer lies in the dependable performance of J&L Steel Pipe. J&L Steel Drill Pipe, Casing, Tubing, Line Pipe, and Standard Pipe are all at work for the gas industry. They help recover gas from underground, transport it in the field, and deliver it into your home.

Extensive research, rigid testing, and complete control of every step in production enable J&L to supply the safety-minded gas industry with tubular products of the highest serviceability.

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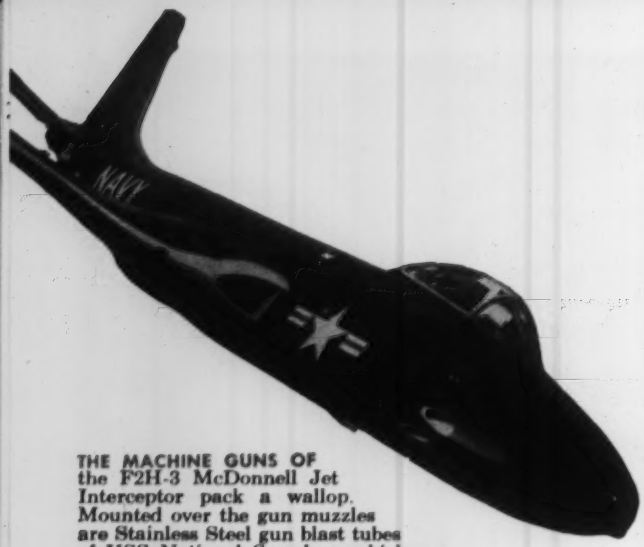
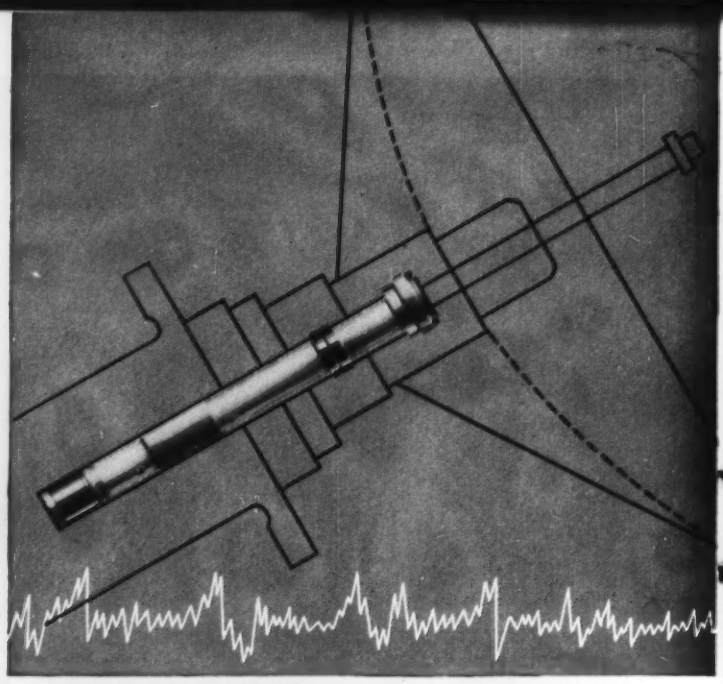
Hot and Cold Rolled Sheet and Strip • Tin Plate • Continuous Galvanized Sheets • Tubular Products • Plates, Structurals, Hot Rolled Bars • Hot Extruded and Cold Drawn Bars • Wire and Wire Products • Alloy Products • Electricweld Tubing • Wire Rope • Steel Containers • Coal Chemicals

J&L—A GREAT NAME IN STEEL

A-670

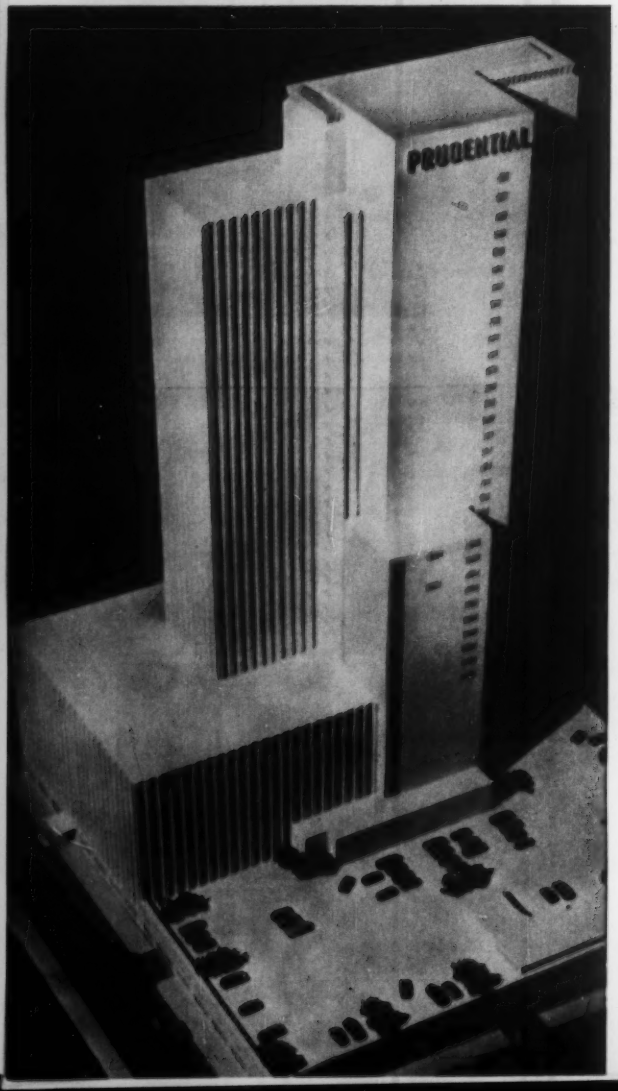


THE MACHINE GUNS OF the F2H-3 McDonnell Jet Interceptor pack a wallop. Mounted over the gun muzzles are Stainless Steel gun blast tubes of USS National Seamless, which restrain high pressures caused by firing the gun and also prevent the backflow of dangerous muzzle gases into the plane itself.

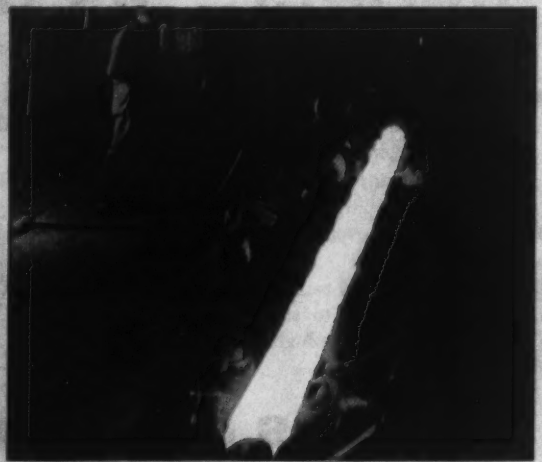


THE WAVE GUIDE TUBE of this radar scanner designed by Davis Industries, Detroit, Michigan, is manufactured from National Seamless Tubes of USS Stainless Steel. It will not corrode, needs no plating, and meets perfectly the required weight and strength factors.

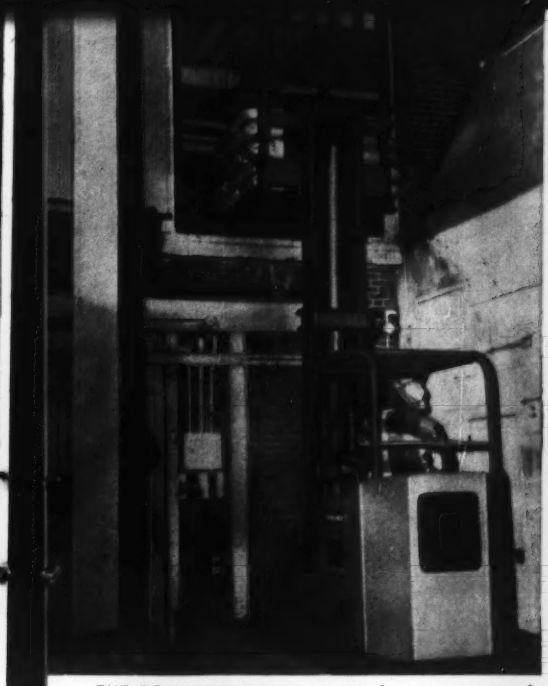
PRUDENTIAL INSURANCE COMPANY'S new Chicago office building employed in its construction more than 162 tons of National Seamless Pipe, diameters ranging from 2 to 20 inches, for heating and air conditioning. No other pipe offers safer and more efficient service.



BACKBONE OF A NATIONAL



THE NATIONAL SEAMLESS METHOD of manufacture is one of the most difficult forging operations in the steel industry. A billet of the finest steel is actually pierced to produce a seamless tube with absolutely uniform wall strength. No welds . . . no joints . . . no weaknesses.



THE TOWMOTOR LIFT TRUCK features a standard mast with one of the highest free lifts in the industry—25½ inches. Key to this powerful action is the hydraulic hoist cylinder of rugged, shock-absorbent National Seamless Mechanical Tubing – the "muscle" that puts the lift into every load hoisted.

THE WORLD'S DEEPEST AND LONGEST Submarine Pipeline Crossing was at the Straits of Mackinac—four miles wide and 250-feet deep. National Seamless Pipe, 20 inches in diameter, was welded into 2,500-foot-long sections for the big pull.

HUNDRED INDUSTRIES...

Seamless Pipe and Tubes

In every type of application—from the intricate heating and air conditioning system of a new skyscraper to the chattering, blazing machine guns of a jet fighter—you'll find USS NATIONAL Seamless Pipe and Tubes.

NATIONAL Seamless combines to the highest degree the desirable qualities of strength, safety and workability. Uniform throughout and dimensionally accurate, NATIONAL Seamless Pipe and Tubes machine cleanly, weld readily, and promise smooth installation and long satisfactory service. National Seamless Tubes are available in a complete range of steel analyses, wall thicknesses and diameters, every foot produced to exacting standards by the world's largest manufacturer of tubular steel products.

Bring your pipe and tubing problems to National Tube. Regardless of the application, our engineers are interested in discussing the problem with you.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

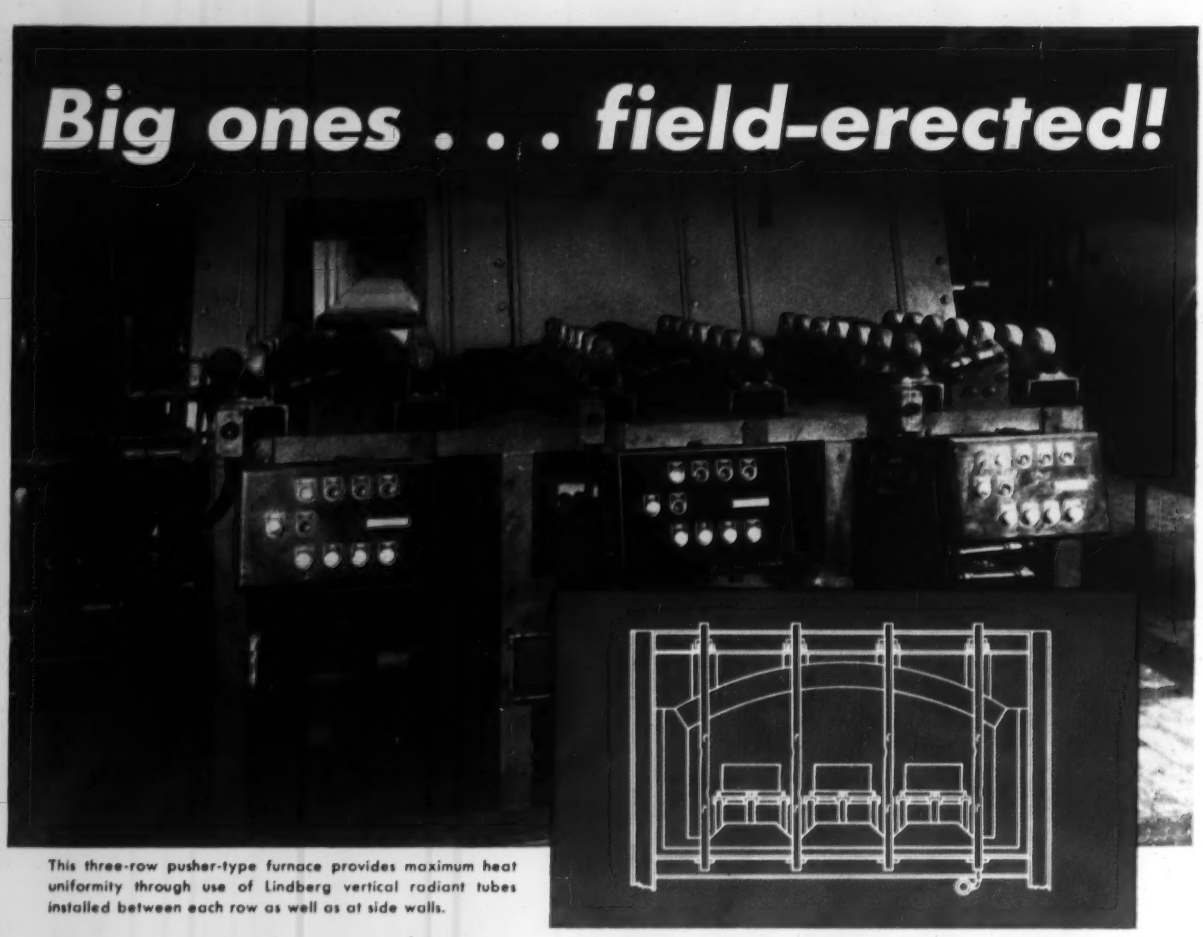
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

USS National Seamless Pipe and Tubes

UNITED STATES STEEL

Big ones . . . field-erected!



This three-row pusher-type furnace provides maximum heat uniformity through use of Lindberg vertical radiant tubes installed between each row as well as at side walls.

If it's a big furnace you need . . . better talk it over with Lindberg

A big automatic pusher-type furnace like the one illustrated is just one of the many types of field-erected equipment Lindberg Industrial can provide industry.

We field-erect big heat treating furnaces, melting furnaces, enameling furnaces, ceramic kilns . . . electric or fuel fired . . . for any application of heat to industry.

Lindberg's years of experience in the broad field of industrial heating equipment, its staff of expert laboratory technicians and experienced application engineers assure your getting the best suited installation for your process and production requirements.

Whatever your needs, if it has anything at all to do with the application of heat to industry—better talk it over with Lindberg.

The Lindberg vertical radiant tube used in this installation weighs only 36 lbs., is only 84" long. Can be changed easily in a few minutes.

Exclusive "dimple" design insures uniform heat over designated length of tube.

These tubes provide ideal heating for controlled atmosphere furnaces.

For any type of industrial heating or processing operation, Lindberg provides a complete analyzing, designing and construction service including completed installation in your own plant. To get immediate, on-the-spot service from an expert Lindberg engineer call your nearest Lindberg Field Office (see classified section of your telephone book) or write us direct.

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American Gas Association

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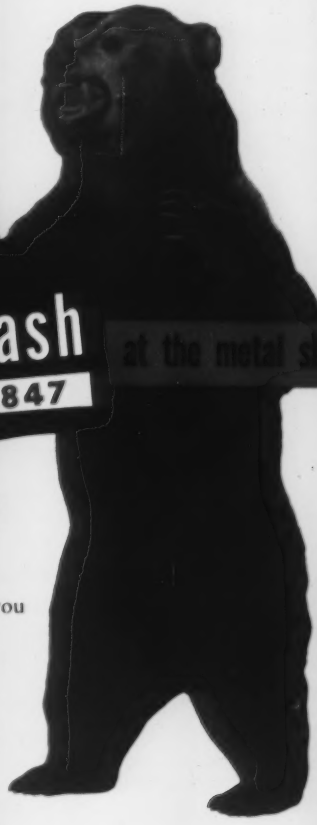
pause for a moment, and enjoy yourself **metalwash** BOOTH 2847 at the metal show!

pose for YOUR photo with the Metalwash Kodiak Bear!

Metalwash has captured this 9-foot Alaskan monster to add to your enjoyment at the Metal Show. We've arranged for you to pose with him at our booth — your free picture will be available immediately for you to take along with you.



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Heat Treating Equipment · Ovens · Complete Finishing Systems · Quench Tanks

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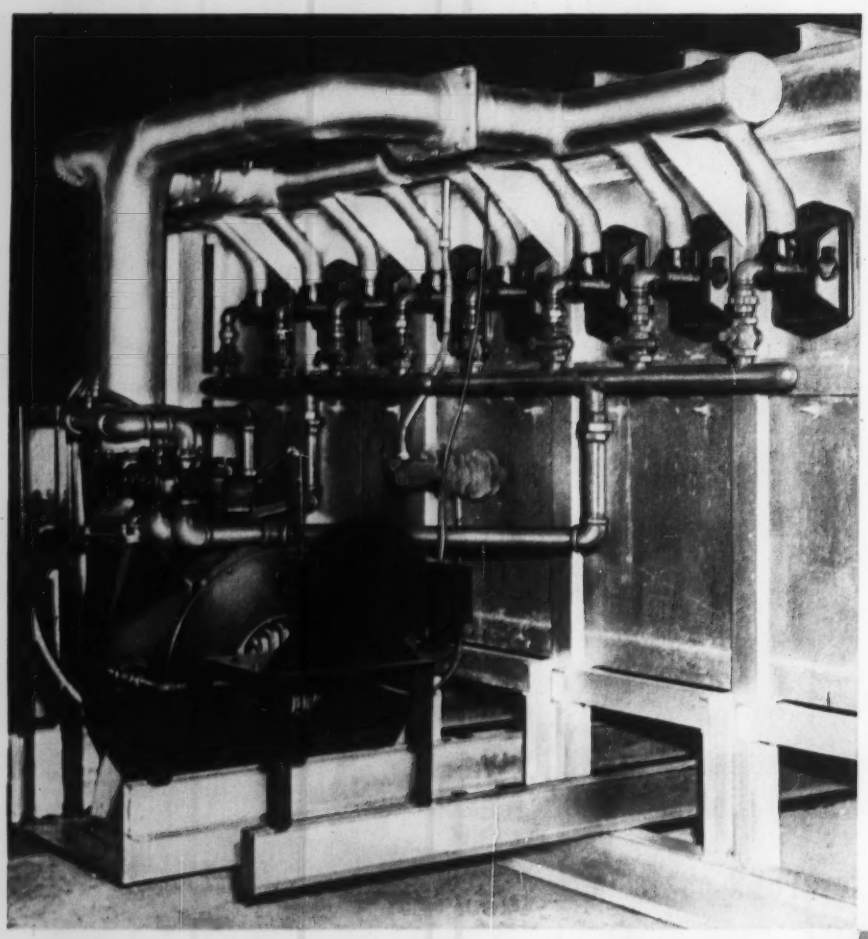
Use MAXON Burner Equipment



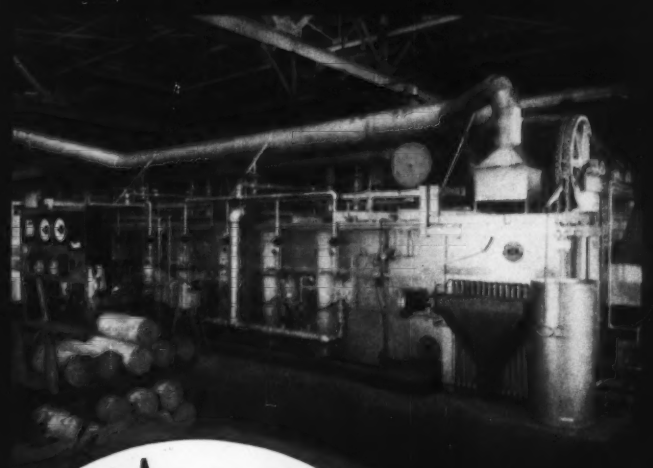
MAXON WIDE-RANGE Burners and Blower, incorporating Micro-Ratio Proportioning Valve, on slot-type forge furnace in plant of prominent mid-west manufacturer.

With one or more units from MAXON'S complete line of industrial burner equipment you probably can improve efficiency, dependability and safety of your heating applications. Let a MAXON Application Engineer consult with you, without obligation, of course.

INDUSTRIAL GAS EQUIPMENT

MAXON

MAXON PREMIX BURNER COMPANY
Muncie, Indiana



Brass Billet Heating Furnace made by W. S. Rockwell Co., Fairfield, Conn.

for automatically controlled high production billet heating

Billet heating furnaces made by W. S. Rockwell Co., Fairfield, Conn., are automatic pushbutton machines every bit as modern as the extrusion presses they feed. The machine shown is installed in a large brass mill and is virtually a mechanical robot which coordinates heating and handling functions to provide automatic control of production rate and quality. Round brass and other copper alloy billets must be heated scale-free. Production rate is based on heating 32 billets 10 in. in diameter by 27 in. long, weighing 630 lb. each, per hour, with 2 hours in the heating chamber.

Precise heating is made possible by use of 20 Eclipse No. 102 ZB Nozzle Mixing Blast Burners. Burners fire over the billets from both sides, using propane, with gas-air mixing at the discharge end of the nozzle. No combustion mixture is carried in the manifolds and back-firing is impossible.

No matter what your combustion problem in industrial furnaces, ovens, or process heating, Eclipse is prepared to solve it, drawing from the most complete selection of combustion equipment available. Send for Bulletin H for further information.

ECLIPSE FUEL ENGINEERING CO., 1190 BUCHANAN ST., ROCKFORD, ILLINOIS
Eclipse Fuel Engineering Co. of Canada, Ltd., 20 Upjohn Road, Don Mills, Ontario

Eclipse

See you at the Metal Show!

"Cy" Capka "Art" Wilcox

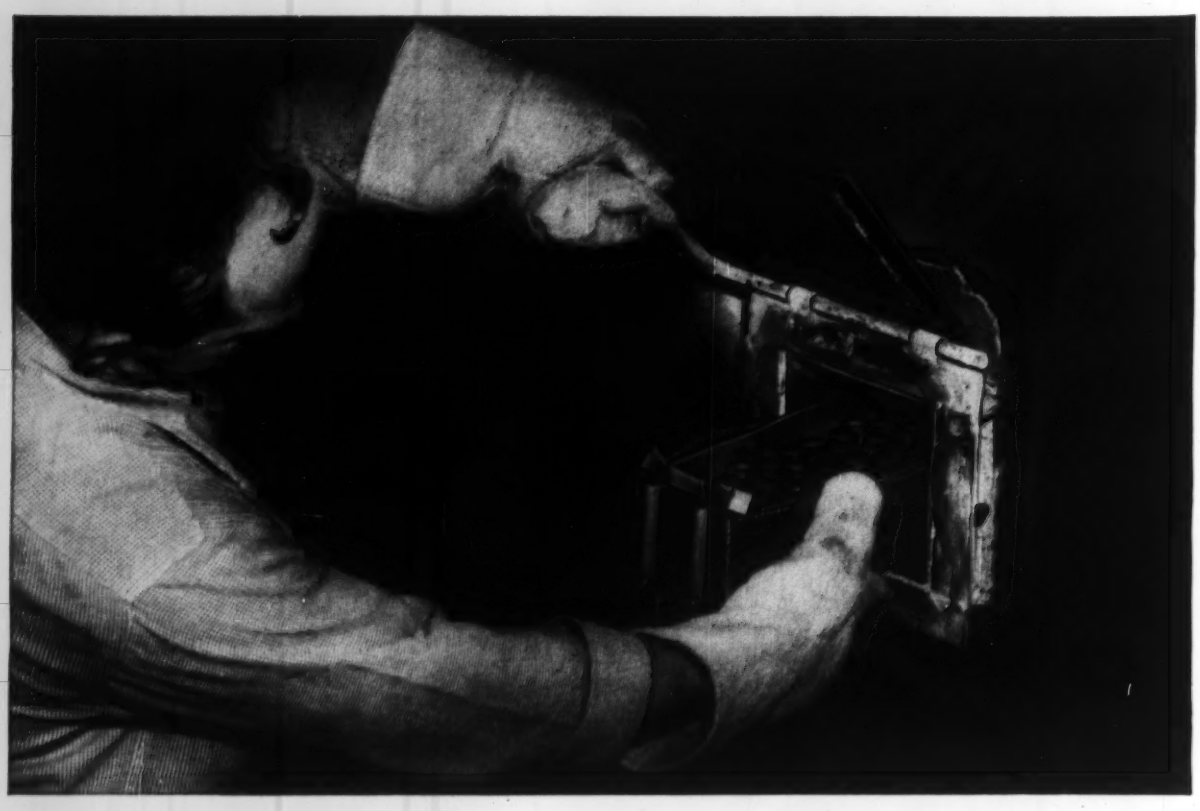
We are looking forward to the chance to greet our old friends and meet many new ones at Booth No. 1724 at the Metal Show. Be sure to allow enough time for us to show you our complete burner display, and extensive valve display which includes: spring-loaded automatic temperature control valves; Lock-tite safety shut-off; and solenoid valves. You will also see our adjustable Vari-Set mixers and the exhibit described below.

Come to the "Peep-show"

BOOTH 1724

Yes, come to our Peep-show where you can operate our new even-heating Radiant Tube Burners and our new Excess Air Burners which provide oxidizing action in process heating and cooling. Don't miss the chance to see these versatile new burners in operation!

ECLIPSE FUEL ENGINEERING COMPANY



720 Hours at 2300 Deg. F ...Didn't Hurt This Muffle

Continuous exposure at 2300 deg. F had little effect on a muffle made of HASTELLOY alloy X and used in this electric annealing furnace. The muffle was subjected to the intense heat for an entire month, 24 hours a day. After this extended service it was examined, found to be in excellent condition, and put back in service.

Actually, HASTELLOY alloy X solved a dual problem for this Company. The muffle is used in a furnace for annealing cold-drawn parts. Periodically, it is used for annealing superalloy parts at 2300 deg. F. Most of the time, however, it is used to anneal stainless steel parts at lower temperatures. Other materials were either inadequate for this service or too costly. Only HASTELLOY alloy X could handle both conditions economically.

HASTELLOY alloy X is a wrought high-temperature alloy with excellent strength and oxidation resistance to 2300 deg. F. For a copy of a booklet describing HASTELLOY alloy X, get in touch with the nearest sales office listed below.

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it takes top cutter design
to get best
cutter performance!

BARBER-COLMAN offers

it takes top cutter design to get best cutter performance!

BARBER-COLMAN offers

Special Form Development

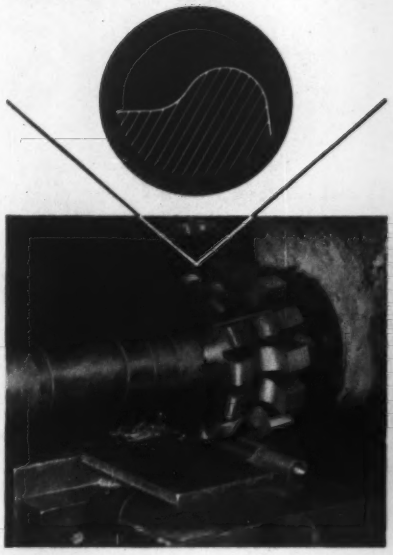
Special form-relieved cutters often allow several operations to be combined into one. Barber-Colman Engineers are experts in designing special tooth forms on form-relieved cutters for solving specific milling problems.

Our cutting tool division has the complete engineering, manufacturing and inspection facilities for making specially-designed form-relieved cutting tools of the finest quality. In addition to designing special forms, our engineers will design into the cutter such special features as axial side clearance, rake angles and helical flutes in any combination to produce maximum cutting efficiency. The best high-speed steel for the specific material to be cut is specified by our experienced engineering staff.

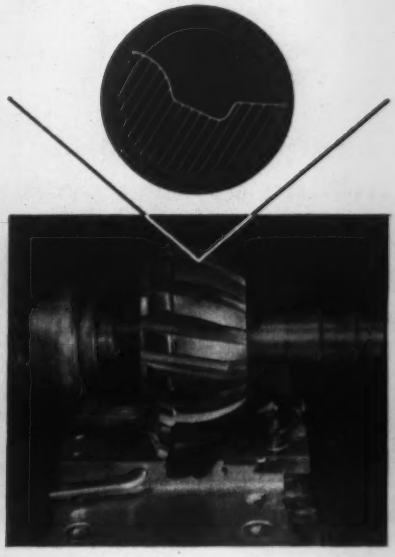
Barber-Colman form-relieved cutters require no "spot sharpening". Accurate face sharpening will maintain the correct form for the life of the cutter. This is true on all cutters including those with axial relief, rake or helical flutes.

Application of Axial Relief

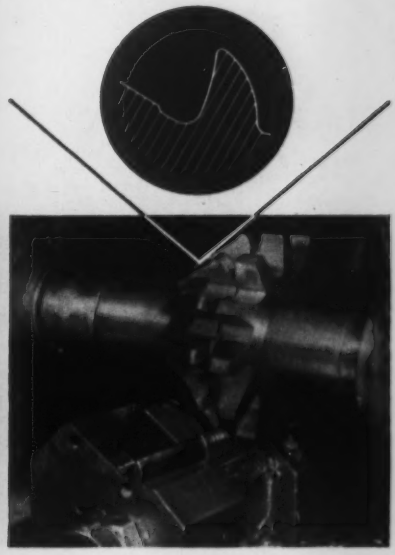
Surfaces which are in a plane perpendicular to the axis of the cutter, or nearly perpendicular, cannot be milled with a form-relieved cutter unless the cutter teeth are provided with axial side clearance. Barber-Colman can solve this problem by making the cutter with axial relief in one or both directions so that several cuts can be combined into a single milling operation. These applications show the proper use of axial clearance and helical flutes.



The form on this part has one side which is nearly perpendicular to the axis of the cutter, requiring a cutter with axial relief as well as radial relief. Both the axial and radial relief are formed onto the cutter tooth at the same time, and they are both applied to the complete tooth form. Consequently, the faces of the teeth can be sharpened without changing the tooth form. Helical flutes are provided to produce a shearing cut for improved finish and cutter life.



The form on this cutter is provided with both radial and axial relief because one small section of the form is nearly perpendicular to the cutter axis. Without axial relief, the perpendicular portion of the form would wear rapidly because of insufficient clearance. However, since the entire form has ample clearance behind the cutting edge, cutter life is greatly improved. Helical flutes eliminate any chatter during the cutting operation.



The workpiece in this application is tipped at an angle so that there is no undercut portion in relation to the axis of the cutter. However, in its cutting position, both sides of the form are nearly perpendicular to the cutter axis. The cutter is a two-piece interlocking type with axial relief in one direction on one side of the form, and in the other direction on the other side of the form. As the cutter is sharpened the form spreads apart, but the correct shape of the form is maintained. The proper dimensional relationship between the form is maintained by simply grinding the spacer between the two sections to the proper thickness.

These are only a few examples of the many special cutter problems passing through our Engineering Department daily. We welcome the opportunity to work with you in solving your production problems, and we invite you to send us part prints. Get top cutting efficiency through top cutter design.

BARBER-COLMAN COMPANY

1300 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

solve special production problems

BARBER-COLMAN offers

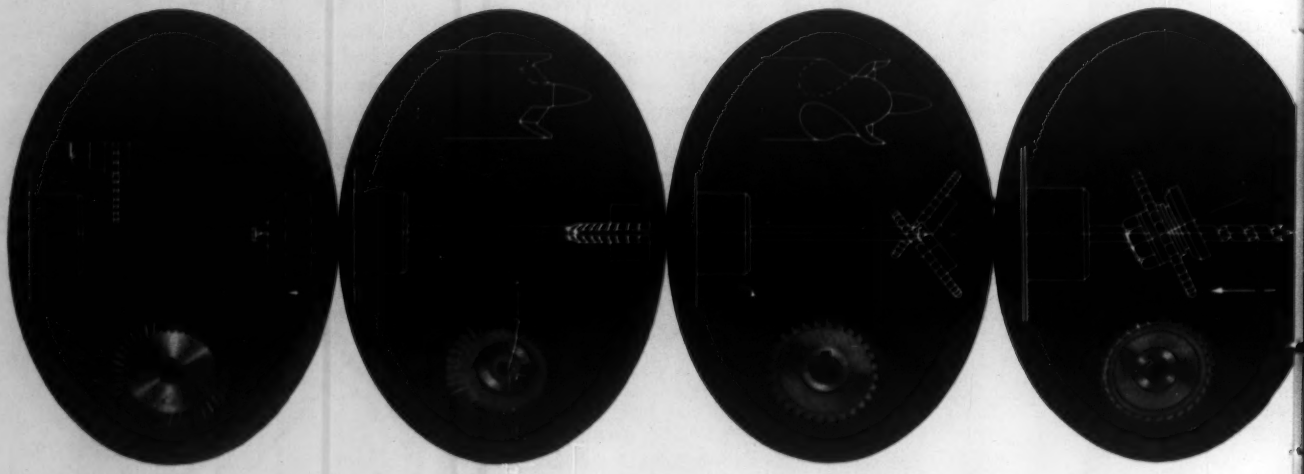
top engineering talent for milling cutter application and design

Milling Cutter Application

This is engineering talent for visualizing how a production operation can be best accomplished through developing the right milling cutters. Barber-Colman cutter engineers have developed this talent to a fine degree through nearly fifty years of cutter design and shop experience. This experience is available to you without cost when you ask Barber-Colman engineers to work with you on your production problems.

Milling Cutter Design

This is engineering talent for making milling cutters work better by combining certain physical elements into the cutter teeth. Such features include side cutting clearance, helical gashes, rake angles and cutter tooth form development, and are the result of many years of actual shop experience. These features, when applied correctly, increase the cutting efficiency and performance of the cutters, thereby producing better job economy.



Finished Bit Cut-Off

Topping Cut Forms Cutting Spurs — 2 Cutters

Throat-Opening Cut Forms Lead Edge — 2 Cutters

Milling First Flute

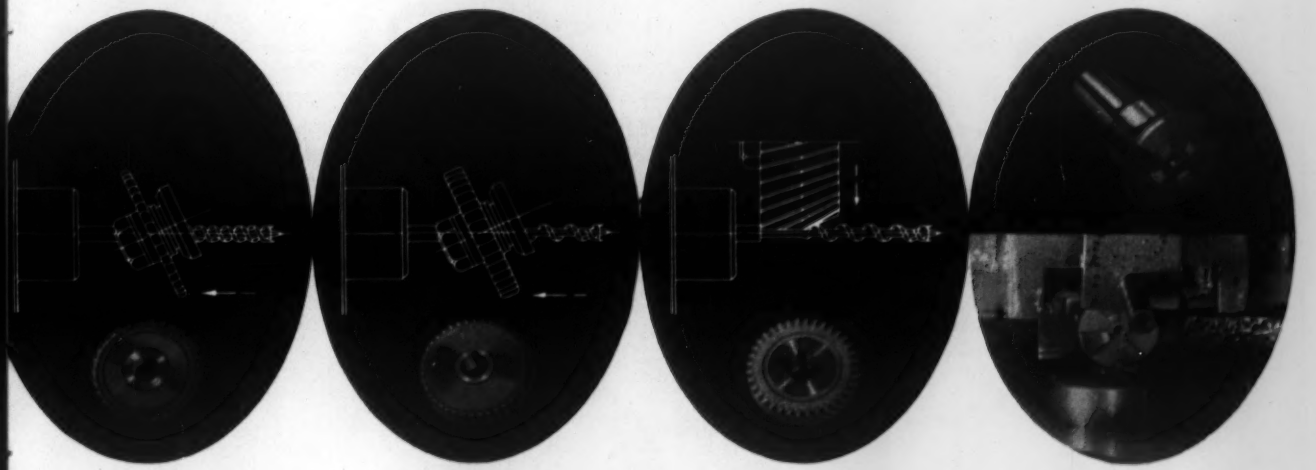
If you are seeking ways to improve production methods and cut manufacturing costs, consult Barber-Colman cutter engineers for counsel and suggestions on milling cutter application and design. Many times this cutter engineering advice can simplify your problems.

working with experienced cutter engineers

Greenlee eliminates hand operations, aided by Barber-Colman cutter engineers.

Greenlee Tool Co., manufacturer of wood boring bits, has eliminated costly hand operations and now produces bits automatically on controlled-cycle machines, using Barber-Colman special milling cutters. These machines, designed and built by Greenlee Bros. Co., were exhibited at the Machine Tool Show last year.

Greenlee engineers visualizing an automatic method to replace all hand operations, designed and built a battery of automatic machines which produce semi-finished solid-center auger bits from bar stock. They asked Barber-Colman engineers to help in the design of cutters which would complement the automatic operation. The sequence of operations is shown here with the corresponding cutters.



Milling Second Flute

Flute Milling Removes One Land

Taper Mill Shank

Thread Milling Screw Point

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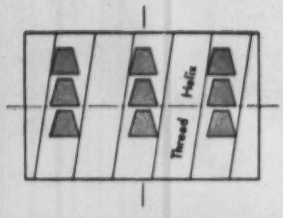
BARBER-COLMAN offers

thread milling requires accurate cutter design!

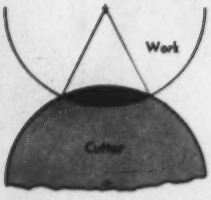
mathematical computation of cutter form

Multiple thread milling cutters often produce a thread space form which is not a duplicate of the cutter tooth form. The cutter tooth form is not a duplicate because the cutter tooth rotates in a plane which is perpendicular to the work axis and at an angle to the thread helix. This generating action produces a fillet at the bottom of the threads, and a thread space which is wider than the cutter tooth. When the amount of generating produces an unsatisfactory thread form, the cutter must be developed to produce the desired thread tooth thickness without fillet interference.

Whenever required, Barber-Colman engineers, by mathematical computation, design the correct cutter which compensates for the generating action. In this computation, the diameter of the cutter is very important since the amount of tooth form correction increases as the diameter of the cutter increases. A thread produced by a specially-developed cutter will have an accurate form which will fit the gage with the desired bearing.

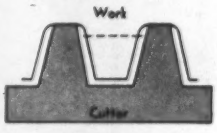


This schematic drawing shows how a multiple thread milling cutter produces a thread space which is wider than the cutter tooth. The cutter is set so that the plane of rotation of the cutter teeth is perpendicular to the work axis, and at an angle to the thread helix.

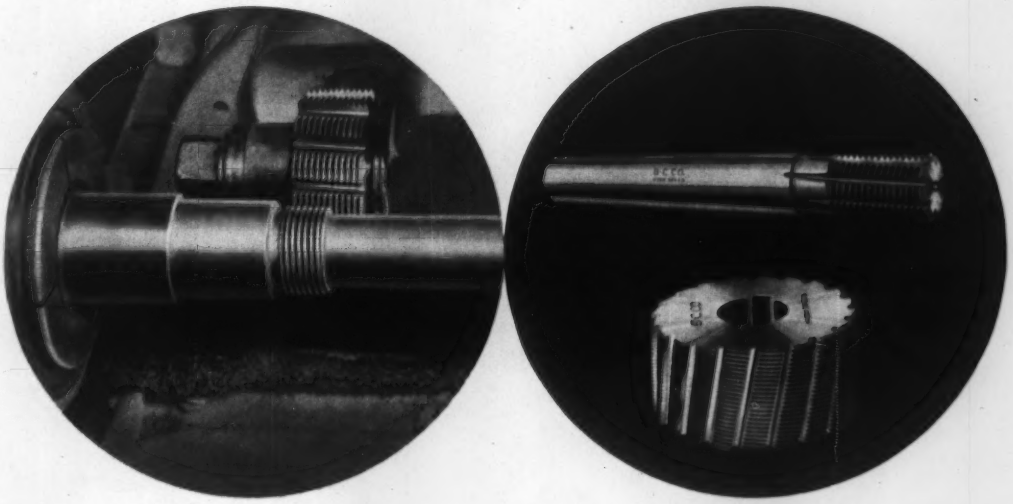


Large diameter cutters have greater length of contact and produce more pronounced fillets.

Small diameter cutters have less length of contact and produce smaller fillets.



In some cases, cutters mill deeper than true thread form. Any generated fillets which may be cut are then below the gaging surface of the thread. Correct cutter design takes care of this automatically.



original cutter accuracy in resharpening

All Barber-Colman form-relieved milling cutters are accurately index-sharpened on Barber-Colman automatic sharpening machines, so that all cutter teeth are the same height and accurately spaced. This makes it easy to maintain original cutter accuracy when resharpening either on automatic sharpeners, or on conventional sharpening equipment using the accurately indexed cutter teeth as a reference. In either case, accurate sharpening to original tolerances is easily maintained, and cutter sharpening time is reduced to a minimum.

design elements for maximum performance

With the proper tooth form developed to cut accurate threads, the engineers then analyze the job conditions to determine which cutter features will produce best cutter performance. These features include selection of the proper cutter material, shell or shank type cutters, straight or helical flutes, rake teeth, axial relief and intermittent teeth if sharp threads are desired. Since we make all classes of ground and unground thread milling cutters, we can recommend the cutter accuracy required for your job.

When you have a threading problem, consult Barber-Colman cutter engineers for their recommendations on the proper cutters for the job. Be sure the cutters you have are accurately designed to cut the correct thread form. Send us blueprints of your threaded parts for quotation on thread milling cutters designed to produce correct threads.

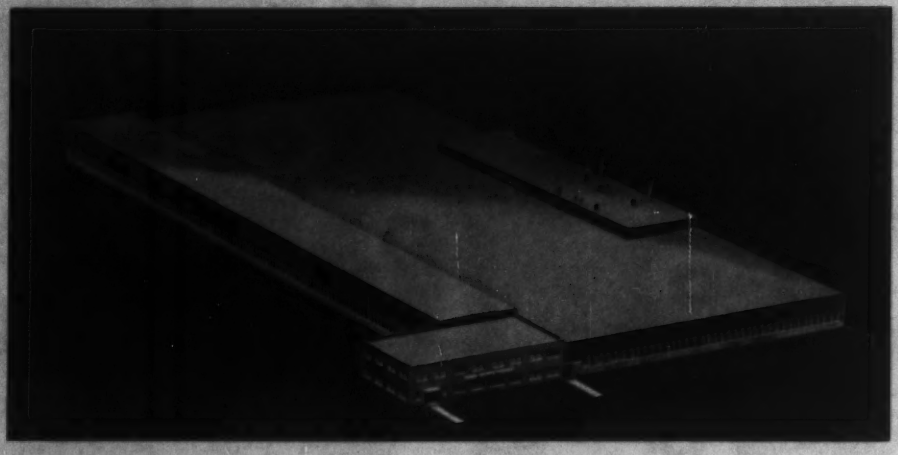
BARBER-COLMAN COMPANY

1300 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

Here's important cutter news!



Barber-Colman Opens New Plant For Manufacturing Milling Cutters and Other Small Cutting Tools. Expanded manufacturing capacity will be helpful to cutter users in scheduling their cutting tool requirements. Visitors are invited to inspect these new modern manufacturing facilities anytime at their convenience.

BARBER-COLMAN COMPANY
ROCKFORD, ILLINOIS

MILLING CUTTER DIVISION

FILL-OUT AND ATTACH TO YOUR LETTERHEAD

Should you find this information not pertinent to your plant responsibility, we would appreciate your passing it along to the proper persons.

Occasionally we will mail information on milling cutters and milling cutter design. If you would like to receive such information in the future, or there are others in your company who should receive these mailings, please indicate the names below. (Check the proper square.)

☐ Please send me future mailings on cutters. ☐ Please address future mailings to:

Name_____ Plant Responsibility_____

Company_____ Address_____

City_____ State_____

☐ Please have a representative call and discuss milling cutter problems.

Quality and service are the unseen ingredients in the steel that JESSOP makes

For 55 years in America and more than a century before that in England, the name Jessop has stood for high-quality specialty steels. This year with production at an all-time high and orders pouring in from good customers, new and old, one might assume that a company in Jessop's position would become complacent . . . would sit back and reap the harvest from former efforts, and rely on diplomacy to excuse slower deliveries.

Not so with Jessop. Jessop is a young and aggressive organization with a determination for absolute leadership. With business booming, Jessop is about to complete the first phase of an ambitious building program involving mills, furnaces, machines and, above all, good technical men. Jessop means to be sure that, as the tide of production rises, quality and service will not recede. Look at the list of products below. This is a good time to become a Jessop customer.

STAINLESS STEELS • HIGH SPEED STEELS • NON-MAGNETIC STEELS HIGH SPEED TOOL BITS • HEAT RESISTING STEELS • STAINLESS-CLAD PLATES • CARBON AND ALLOY STEELS • TOOL STEELS FOR SPECIAL PURPOSES • CAST-TO-SHAPE TOOL STEELS • HIGH SPEED AND ALLOY SAW STEELS • TEMPERED AND GROUND STRIP STEEL • COMPOSITE HIGH SPEED STEELS • STAINLESS AND HEAT RESISTING CASTINGS • COMPOSITE DIE STEEL SECTIONS • PRECISION GROUND FLAT STOCK • DIE STEELS—HOT AND COLD WORK

JESSOP

STEEL COMPANY · WASHINGTON, PENNSYLVANIA

OFFICES IN PRINCIPAL CITIES

Jessop Steel of Canada Limited, Wallaceburg, Toronto

Jessop Steel International Corp., Chrysler Building, New York, New York

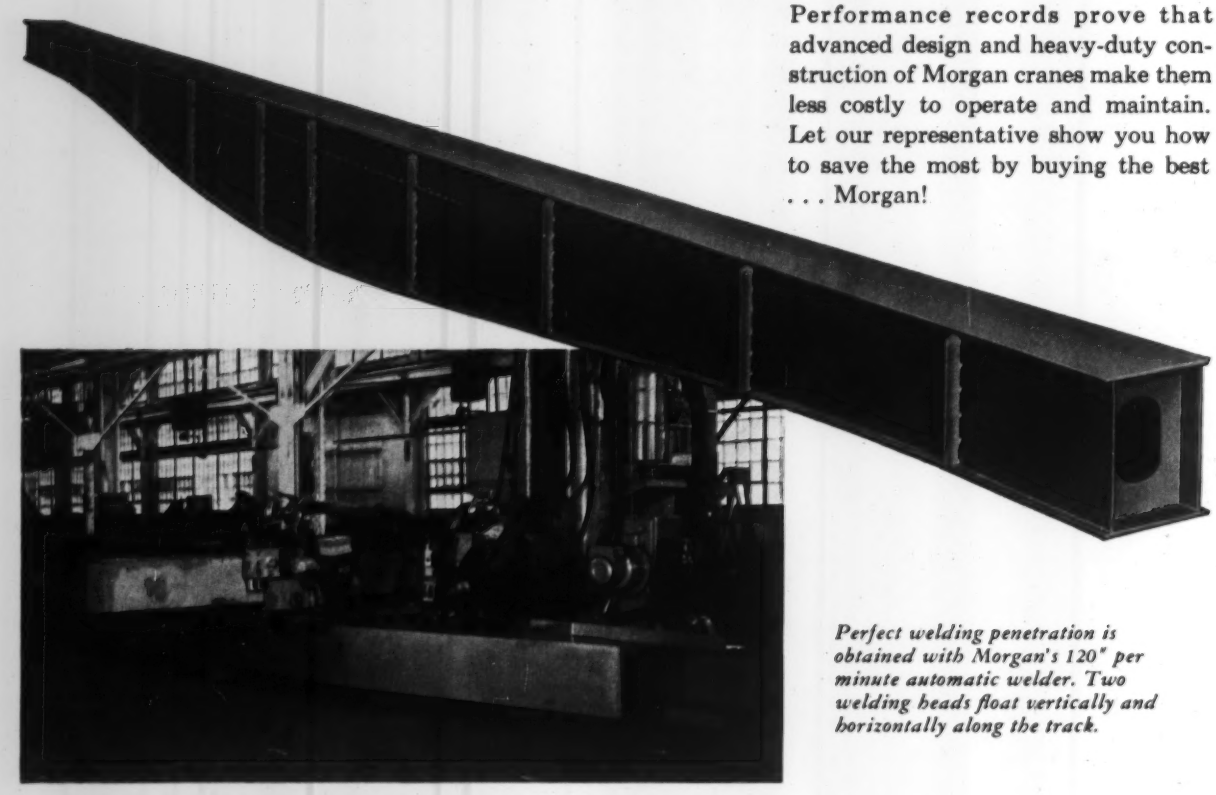
How Morgan cranes get a stiffer backbone ...automatically

● MORGAN CRANES are stronger, more rigid . . . because girder joints and seams are welded automatically on the world's largest continuous welder. Casting imperfections and hand welding variables are eliminated with Morgan automatic welding. All joints are uniform and sound.

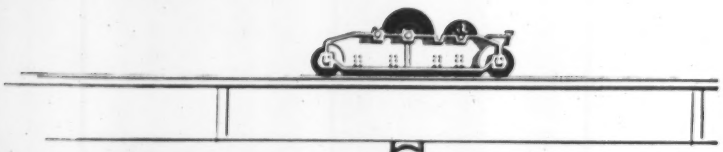
Crane drums, too, are welded automatically, making them stronger and lighter. Casting shrinkage voids are eliminated.

Morgan welders are qualified in accordance with A.S.M.E. and A.W.S. codes.

Performance records prove that advanced design and heavy-duty construction of Morgan cranes make them less costly to operate and maintain. Let our representative show you how to save the most by buying the best . . . Morgan!



Perfect welding penetration is obtained with Morgan's 120" per minute automatic welder. Two welding heads float vertically and horizontally along the track.



THE MORGAN ENGINEERING CO. *Alliance, Ohio*

The Morgan Engineering Company, founded in 1868, manufactures overhead electric traveling cranes, gantry cranes, charging machines, plate mills, blooming mills, structural mills, shears, saws, and auxiliary equipment.

GET AMERSTRIP!

Why buy Amerstrip? Simply this: it brings you a finish tailored to your needs. High quality Amerstrip will minimize reject problems and improve the finished product. These are the best reasons, but not the only ones, for choosing Amerstrip cold rolled strip steel.

The metallurgical care that goes into making the Amerstrip, the even temper that goes with every shipment, also help you cut rejects and costs, help you make steadily improved products of steel.

Amerstrip comes in the widest available range of analyses, sizes, and finishes. You can get it embossed, coated, or in any of the standard finishes.

Specify Amerstrip.

Amerstrip

USS

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

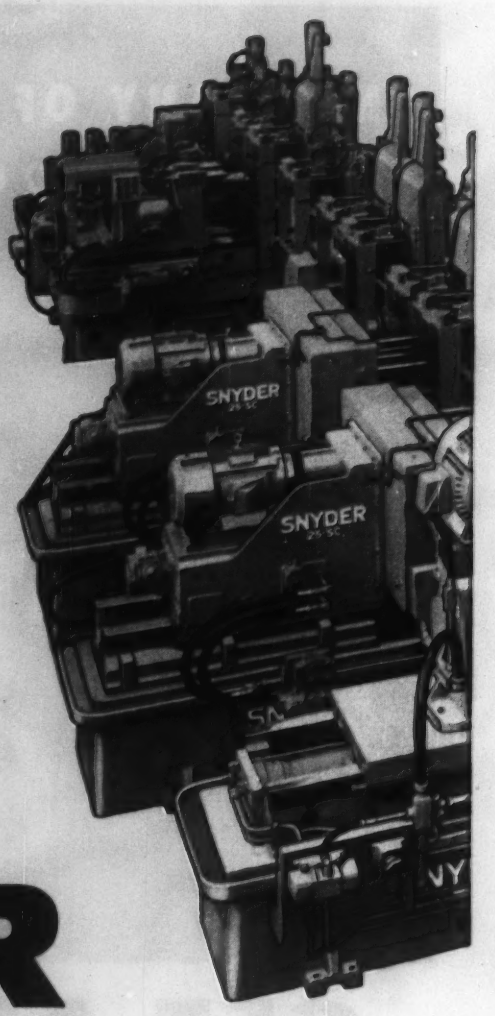
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

UNIQUE FEATURES IN SNYDER 9-SEGMENT, 24-STATION, IN-LINE AUTOMATED TRANSFER MACHINE

for processing converter housings; independent control panels permit individual segment operation (co-ordinated with master panel); electric circuits can be individually checked by Circuit-Sleuth Panel; at Station 4, workpiece is re-oriented 90°; at Station 21, two dowel holes and one transmission hole are precision bored to .001 in size; at Station 22 these holes are automatically precision air gaged.

Workpiece reaches machine finish ground on both faces; machine performs 59 operations, delivers workpiece completed and automatically inspected. Production, 128 pieces an hour at 100% efficiency.

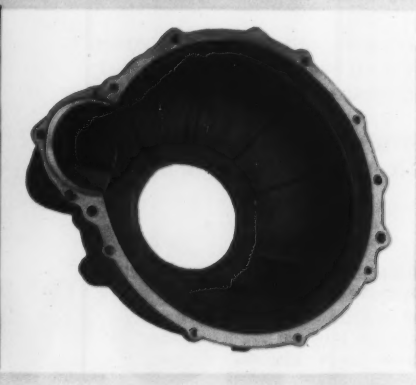


SNYDER

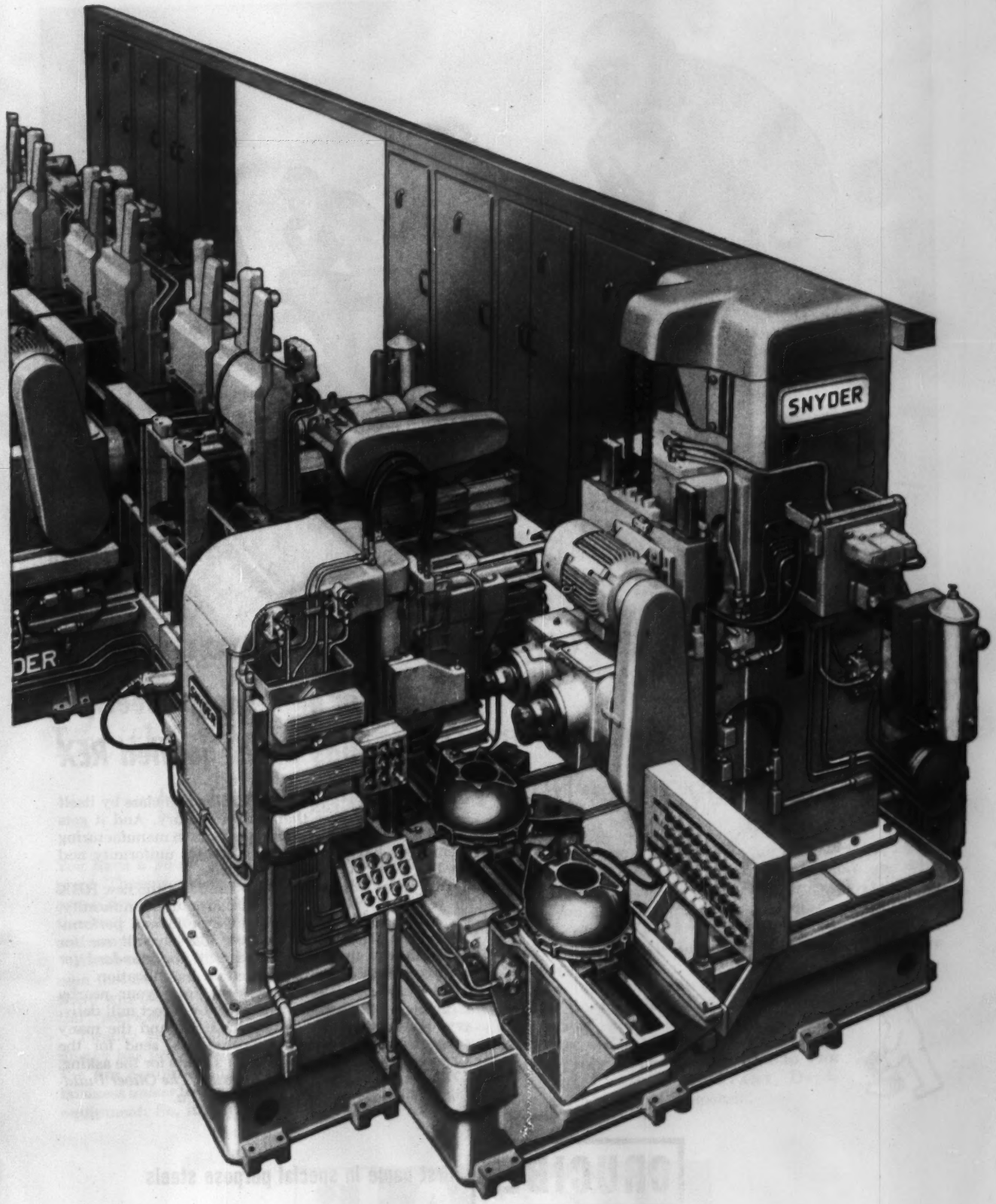
TOOL & ENGINEERING COMPANY

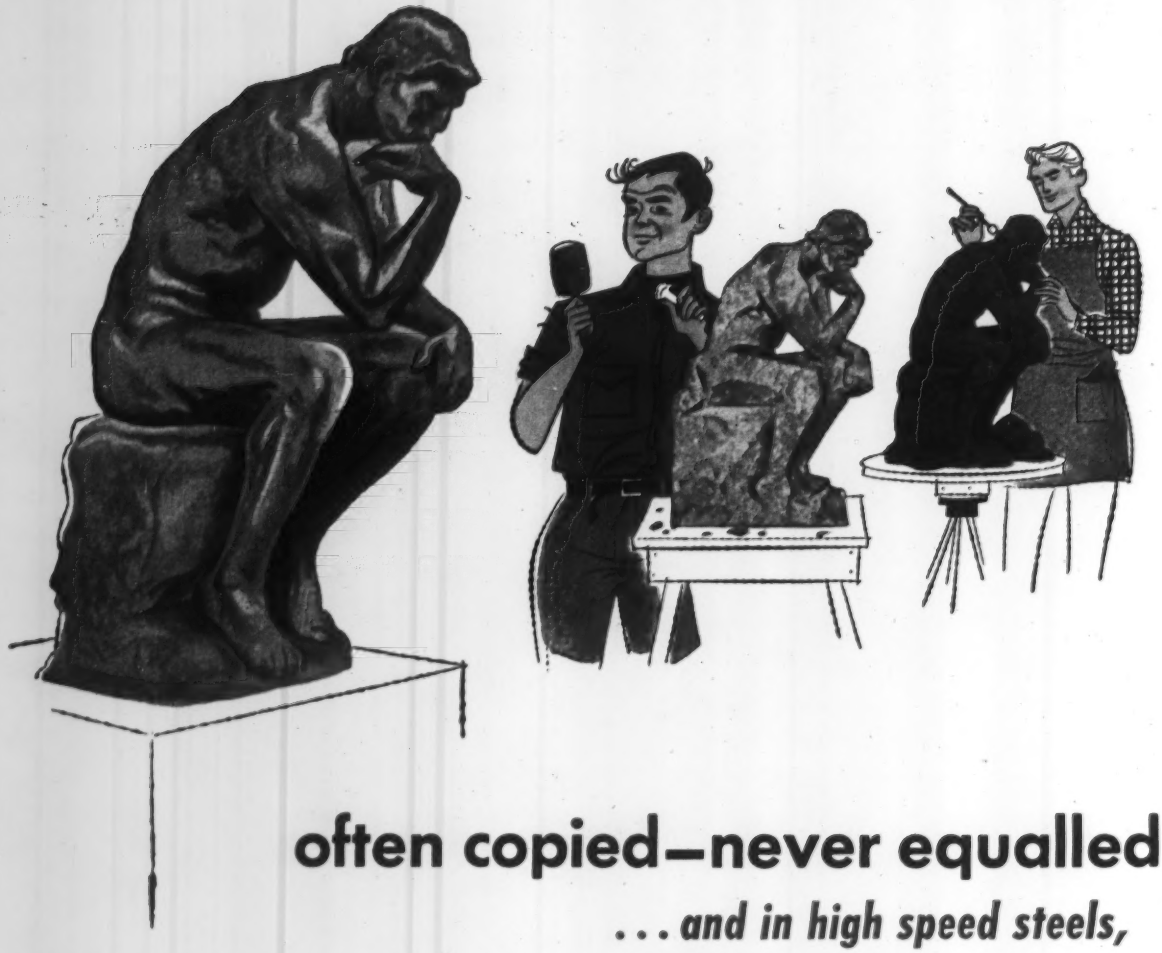
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

31 Years of Special Machine Tools with Automation



Boring and air gaging stations.


SNYDER



often copied—never equalled

... and in high speed steels, nothing has ever equalled REX

Crucible's REX® high speed steel is in a class by itself—has been for more than half a century. And it gets better every year. New improvements in manufacturing techniques have brought even greater uniformity and quality to its well-known properties.

But prove this for yourself—shop-test the new REX in your own plant. Check its structure, uniformity, response to heat-treatment—all-around tool performance. Try REX any way you like—you'll see for yourself why the new REX is still the *standard for comparison* in every high speed steel application.

You can get REX from stock from your nearby Crucible warehouse—or promptly by direct mill delivery. For further information on REX and the many other Crucible special purpose steels, send for the *Crucible Publication Catalog*—it's yours for the asking. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Let this "Visiting Fireman" train your men to fight fire . . . it could save your business

You have a *potential* fire-fighting team right in your plant. These would-be fire fighters *could save your business if fire struck unexpectedly*. All they need is training, the kind that will enable them to respond instantly and properly to any kind of fire emergency.

Ansul can provide this training for a group of your men just as it has for hundreds of its customers. And there will be no charge. It is just one of the "essential" services that Ansul provides for its customers.

Twenty years experience in the fire protection industry has proved to Ansul many times over that all the fire equipment in the world will not save your business *unless* trained hands are available to man that equipment. So, it is important to Ansul that you get *training* along with the fire equipment you buy. Only then will you experience the security that goes with having a complete fire protection program. Only then will you get what you really pay for, what you really need—*complete fire protection*.

You owe it to the life of your business to learn more about Ansul's in-plant fire training service. Get in touch with your local ANSUL MAN through the yellow pages of your phone directory, he will be happy to call on you and explain all of Ansul's customer services in detail. Or write to THE ANSUL CHEMICAL COMPANY, Dept. S - 10, Marinette, Wisconsin.

ANSUL

New Accuracy New

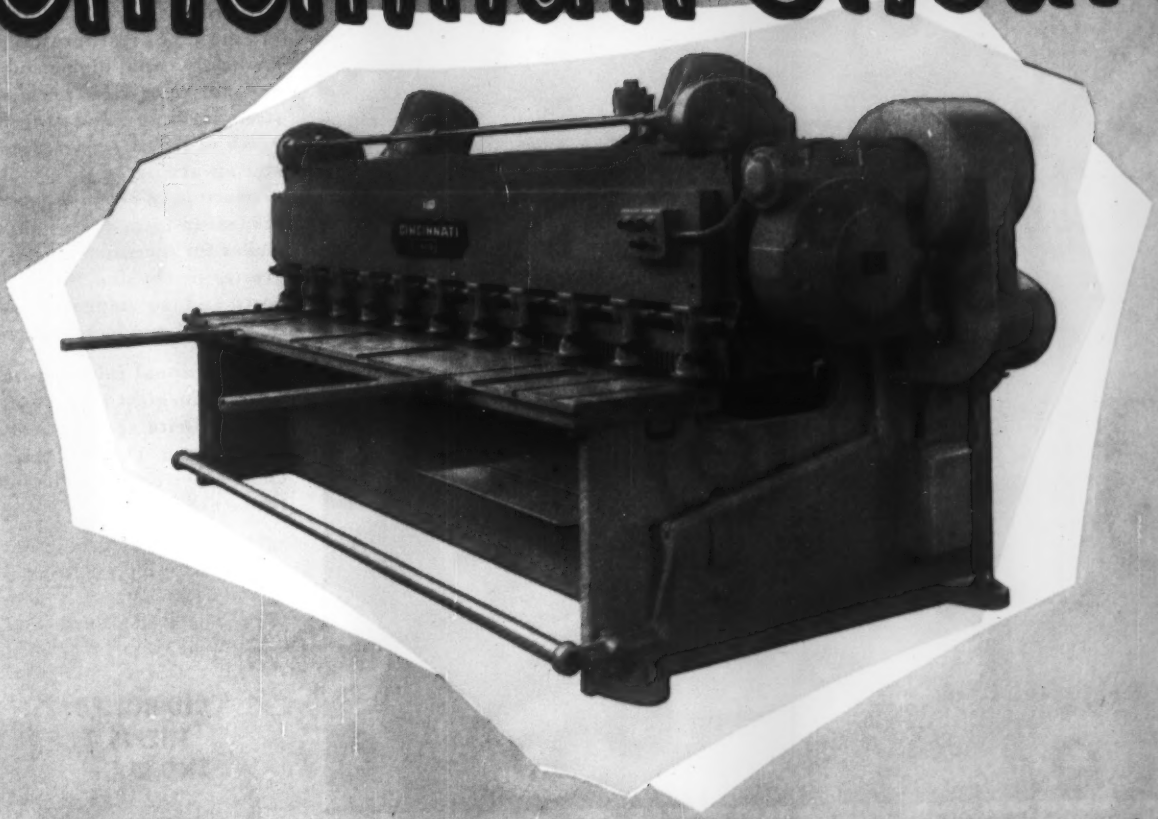
New Quiet

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Cincinnati Shears



New design in Cincinnati Shears has brought a new quiet and accuracy in performance.

New low rake has increased accuracy—producing blanks to very close tolerances with straight clean edges.

The new design, powerful hydraulic holddowns operate quietly and assure full pressure for holding. Front control of the power back gauge saves time in operation and gives a positive, accurate, easy control of gauging from operator's working position.

Write for catalog S-7R.

Youngstown Sheets and Strip are Quality Controlled to help Control your Product's Quality

Photo courtesy Hydraulic Press Mfg. Co.

When you specify Youngstown Cold Rolled Sheets and Strip you get a product of uniform high quality. Tested and inspected at every step in Youngstown's fully-integrated operations, they are held to rigid high standards of ductility, tensile strength, flatness and surface finish — which guarantees you an almost continuous production of even the most difficult-to-form parts. This makes for increased profits, greater production, lowered costs and an improvement in over-all product quality.

For additional information or metallurgical assistance, call or write your nearest Youngstown District Sales Office—or write direct to our Home Office.

QUALITY · YOUNGSTOWN · SERVICE

COLD ROLLED SHEETS AND STRIP

Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY

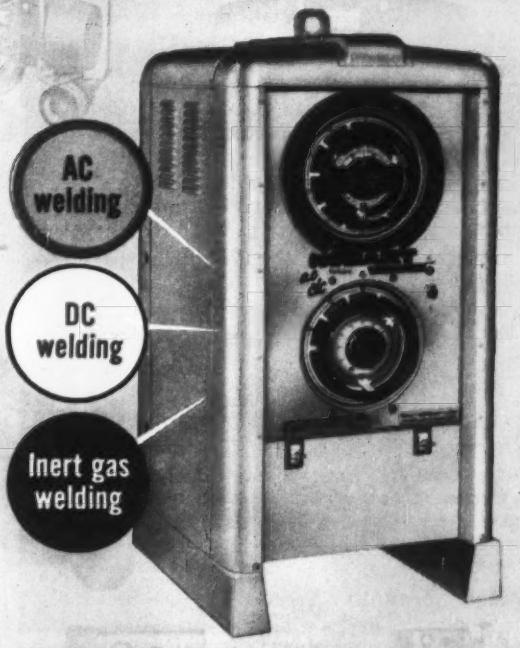
Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices—Youngstown, Ohio District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

Announcing
two NEW welder models

. . . that set new standards in modern arc welding with their wider welding range, greater speeds and extra features.



See and try them at the METAL SHOW Oct. 6 thru 12 Space 2541 lower exhibition hall

* Both models equipped with **REMOTE CONTROL**

NEW ac-dc welder and NEW dc rectifier welder

Now you can have greater welder performance, more versatility for a much wider range of welding, and a new ease of operation. This new AC-DC Welder lets you take full advantage of the latest types of electrodes and sizes for both AC or DC welding. Makes every job easier with added assurance of high quality welds at lower cost.

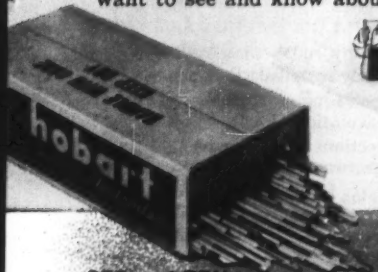
Models also available in this AC-DC unit for doing Inert Gas Welding. It's new—it's something you'll want to see and know about.

This new DC Rectifier offers outstanding features for better welder performance in keeping with modern developments in production equipment for lowering costs. Simplified controls and a wide welding range let you get into the low ranges with top quality, let you select polarity by a flip of the selector switch. You'll find many new improvements in this new light weight Rectifier. Get complete information for comparison. HOBART BROTHERS CO., Box ST-106, Troy, Ohio, Phone 21223.

"One of the world's largest builders of arc welding equipment"

HOBART TROY OHIO WELDERS

HOBART · ELECTRODES · WELDERS



SEE and TRY Hobart's new iron powder electrodes. You'll marvel at the new speeds and ease of handling of these new type electrodes that produce sound, strong, ductile welds at much lower cost. Ask about Hobart's Rocket 14, Rocket 24 and Rocket 27.

Use the coupon!

HOBART BROTHERS COMPANY
Box ST106, TROY, OHIO

I'm interested in the new

- ☐ *AC-DC Arc Welder*
- ☐ *AC-DC Arc Welder with Inert Gas Controls*
- ☐ *DC Rectifier*
- ☐ *Send catalog on other types of manual arc welders*

_____ *amp. capacity*

Name _____

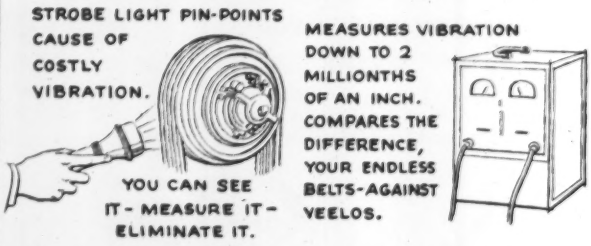
Address _____

City _____ *State* _____

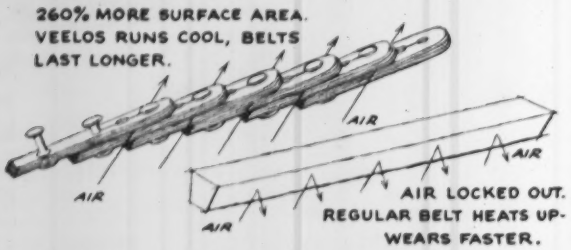
Six Reasons Why Veelos Adjustable V-Belts Are Better For Your Drives!

EACH VEELOS LINK IS IDENTICAL IN WEIGHT AND SIZE. INSURES SMOOTH, FULL-POWER DRIVE.
DENSE AREAS IN ORDINARY BELTS CAUSE VIBRATION . . . MACHINE WEAR

1. Balanced construction of Veelos Belts assures you faster, cleaner work, less rejects . . . less bearing wear. Each link and stud is identical in size and weight. Ordinary belts have varying spots of density which cause excess vibration—chatter marks, machine wear.


STROBE LIGHT PIN-POINTS CAUSE OF COSTLY VIBRATION.
YOU CAN SEE IT - MEASURE IT - ELIMINATE IT.
MEASURES VIBRATION DOWN TO 2 MILLIONTHS OF AN INCH. COMPARES THE DIFFERENCE, YOUR ENDLESS BELTS-AGAINST VEELOS.

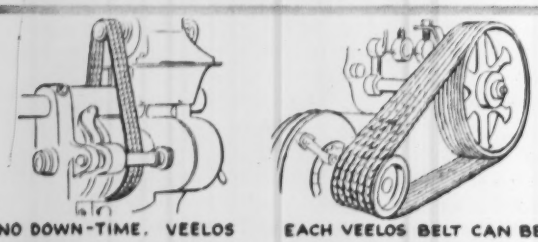
2. Electronic proof—up to 90% less vibration! With a vibration analyzer, you see, on your own machine, how Veelos belts decrease vibration up to 90% over any belt you're now using. This amazing Veelos test pin-points the belt that has the "invisible shakes."



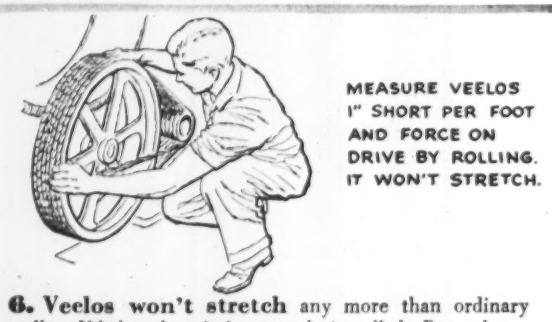
3. Cooler running—long life! Veelos breathes! Constant circulation of air keeps Veelos running smooth. Regular V-belts have no chance to cool, heat builds up from the inside . . . causes slippage, wastes power, heats bearings, reduces belt life.

AREA CONTACT
POINT CONTACT
PERFECT VEELOS FIT. EXTRA THICKNESS AND MACHINE-CUT SIDES PREVENT BOTTOMING. MEAN CONSTANT POWER.
POWERLESS POINT CONTACT OF ORDINARY V-BELT. BULGES, SLIPS, CAUSES UNEVEN SHEAVE WEAR.

4. Greater flexibility reduces slippage! Sectional construction, beveled links allow greater flexibility, longer belt life. Each link moves around sheave independently and maintains full contact, constantly. Full area contact allows shorter centers, smaller sheaves.


NO DOWN-TIME. VEELOS FITS ANY DRIVE - WITHOUT DISMANTLING.
EACH VEELOS BELT CAN BE ADJUSTED - NO NEED FOR EXPENSIVE MATCHED SETS.

5. Simple installation "knocks out" down-time! Saves up to 50% installation time on outboard bearing drives, more when belt length isn't in stock. No resetting, tilting or moving motors. Veelos can be made any length, can be changed by adding or removing links.



6. Veelos won't stretch any more than ordinary endless V-belts when it is properly installed. *Remember—measure Veelos 1" short per foot and roll on drive as tightly as possible.* With the first few revolutions Veelos studs accept a permanent set into the sections they connect.

4 TYPES—FOR ALL DRIVES

VEELOS
THE BALANCED LINK V BELT

Known as Veelink outside U.S.A.

For all sizes and types of drives. Double-V available for serpentine drives.

Write for free Veelos Data Book or Veelos Vibration Demonstration to:

MANHEIM

Manufacturing & Belting Co.
409 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

© M.M.&B. Co. 1956

Simple hand assembly of five .209" formed components into a complete housing dramatically demonstrates the precision of stampings produced on By-Products' new press line. No additional finishing or machining is necessary before final fit-up.

Formed to FIT . . . as they come off the line!

OUR VERSATILE NEW PRESS LINE CAN CUT PRODUCTION STEPS FOR YOU!

■ With a new press line for deep drawing and mass producing light gage precision parts—like the units that make up the compressor housing pictured above—*plus* extensive facilities for producing heavy plate shapes, By-Products Steel Co.'s service is now even more flexible, more useful to you!

Today, By-Products can satisfy requirements for precision formed components all the way from sheet gages up into heavier plate thicknesses. Combined with the new press line, more than 150 machines offer you the most complete plate shaping service available.

We've made the investment in equipment and manpower! You pick up the benefits . . . in lower overhead . . . fewer production steps in your shop . . . reduced freight . . . virtually no scrap loss . . . lower production costs.

Get complete details. Write, outlining your interests, to Manager, Marketing Service, 832 Lukens Building, Coatesville, Pennsylvania.

■ **PRESS LINE UNITS**

1. Automatic Loader and Greaser
2. 900 Ton Press
3. Washing Machine
4. Annealing Furnace
5. 600 Ton Press
6. Trimming Press
7. 22 Ton Punching Press
8. 45 Ton Punching Press
9. 150 Ton Punching Press

Units are linked by reversible conveyors for fast, economical production.

BY-PRODUCTS STEEL CO. LUKENS

A DIVISION OF LUKENS STEEL COMPANY, COATESVILLE, PENNSYLVANIA

The MORSE

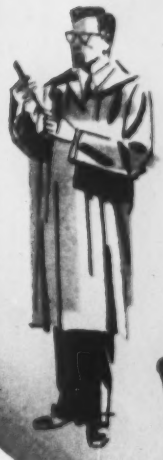
Another Reason Why—MORSE

MORSE EXPEDITING TEAM

MORSE PRODUCTION TEAM

MORSE PRODUCT DEVELOPMENT TEAM

MORSE INVENTORY CONTROL TEAM



MORSE MACHINE DESIGN TEAM

MORSE TEAM OF CARBIDE TOOL SPECIALISTS

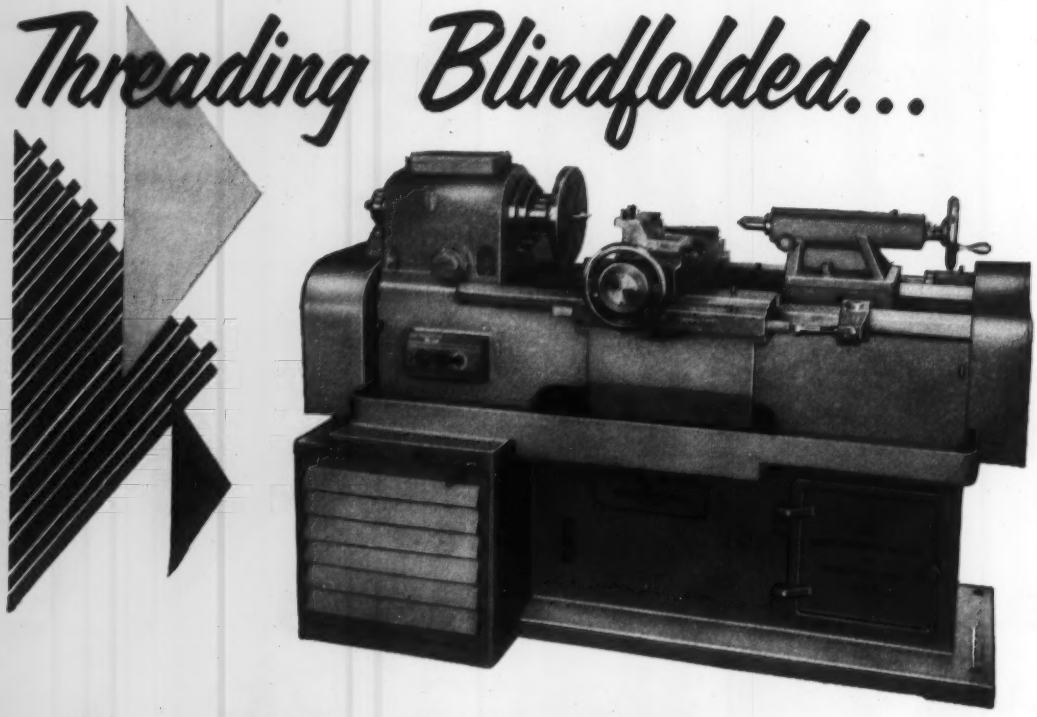
TEAM

...all Specialists ...all Backing Up your MORSE FRANCHISED DISTRIBUTOR

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.
Subsidiary of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

means "THE MOST" in Cutting Tools

Threading Blindfolded...



It's really possible with the NEW
COULTER Model "B" THREADING MACHINE

HERE IS YOUR INTRODUCTION TO THE *NEW* COULTER MODEL "B" HIGH SPEED, SINGLE POINT THREADING MACHINE . . . *the machine with an automatic threading cycle!*

Never before has a threading machine been so easy to operate! Just put the work in, push a button and the COULTER "B" goes through a predetermined threading cycle; coming to a stop when the piece is threaded — set for the next piece, *automatically!* You never worry about the thread diameters, for the "In-and-Out" tool mechanism controls the diameters, *automatically.*

A Few Exclusive Features

- ...A worm and gear spindle drive!
- ...Work spindle operates in one direction of rotation!
- ..."Pick off" gears permit changing from one pitch to another quickly!
- ...Electrically controlled clutch assures starting and stopping on time!

Thread it Better, Faster . . . AUTOMATICALLY, with a COULTER.

For Information on the New COULTER "B", write, wire, phone.

The *James Coulter Machine Co.* 631 Railroad Ave.
Machine Tool Builders Since 1896 Bridgeport 5, Conn.

here's proof

This ogive was deep drawn from a sheet of Weirzin.
Photomicrographed cross sections from ogive are magnified 1500 times.

WEIRZIN Electrolytic Zinc-Coated Steel keeps a flawless protective coating even after deepest draws

The edge view cross sections shown above prove that approximately the same thickness of ductile zinc coating remains at the extremity of the draw, 4, as at the base, 1.

That's proof that even during a deep draw Weirzin's tightly bonded coating adheres evenly to its ductile steel base without peeling or flaking, and so continues to provide complete protection against rust or corrosion.

Weirzin is available with or without chemical treatment in coils or cut lengths, in all regular widths and gauges. If you would like specific information on the many ways in which Weirzin may benefit your product, please fill in and mail this coupon today.

WEIRTON STEEL COMPANY
WEIRTON, WEST VIRGINIA
a division of
NATIONAL STEEL CORPORATION

WEIRTON STEEL CO., Weirton, West Virginia

I would like to know more about Weirzin

My product is _____

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____

STATE _____

AEROQUIP HOSE LINES . . . as near as your telephone in 125 industrial areas

Flexible Hose Lines with reusable Fittings

Self-Sealing Couplings

The solution to your industrial plumbing problems is as near as your telephone. The man to call is the Aeroquip distributor serving your locality. His thorough experience with all types of industrial fluid systems fully qualifies him to be of assistance to you. He stocks a complete supply of Aeroquip Hose, Detachable and Reusable Fittings, and Self-Sealing Couplings. He can show you how to save time and expense by making your own Aeroquip Hose Assemblies from bulk stock. If you are in or near one of the cities listed, you'll find your Aeroquip distributor's name in the Yellow Pages of your telephone directory under the Aeroquip Trademark in the hose classification.

ALABAMA—Birmingham
Montgomery
ARIZONA—Phoenix • Tucson
ARKANSAS—Little Rock
CALIFORNIA—Humboldt County
Imperial County • Long Beach
Los Angeles • Oakland
Sacramento • San Diego • San
Francisco • San Jose • Shasta
County
COLORADO—Denver
CONNECTICUT—Bridgeport
Hartford
DELAWARE—Wilmington
D. C., WASHINGTON
FLORIDA—Jacksonville • Miami
Orlando • Tampa
GEORGIA—Atlanta • Augusta
Macon • Savannah
ILLINOIS—Chicago • LaSalle
Oak Park • Peoria
INDIANA—Indianapolis
Evansville
IOWA—Dennison • Des Moines
KANSAS—Wichita
KENTUCKY—Louisville
Owensboro
LOUISIANA—Baton Rouge
New Orleans • Shreveport
MAINE—Portland
MARYLAND—Baltimore
MASSACHUSETTS—Boston
MICHIGAN—Detroit • Flint
Grand Rapids • Jackson
Kalamazoo • Lansing • Muskegon
Saginaw
MINNESOTA—Minneapolis
Duluth • St. Paul
MISSISSIPPI—Jackson • Natchez
MISSOURI—Kansas City
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MONTANA—Billings
NEBRASKA—Omaha
NEVADA—Reno
NEW JERSEY—Camden
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Roanoke
WASHINGTON—Spokane
WEST VIRGINIA—Charleston
Wheeling • Williamson
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Milwaukee

Aeroquip

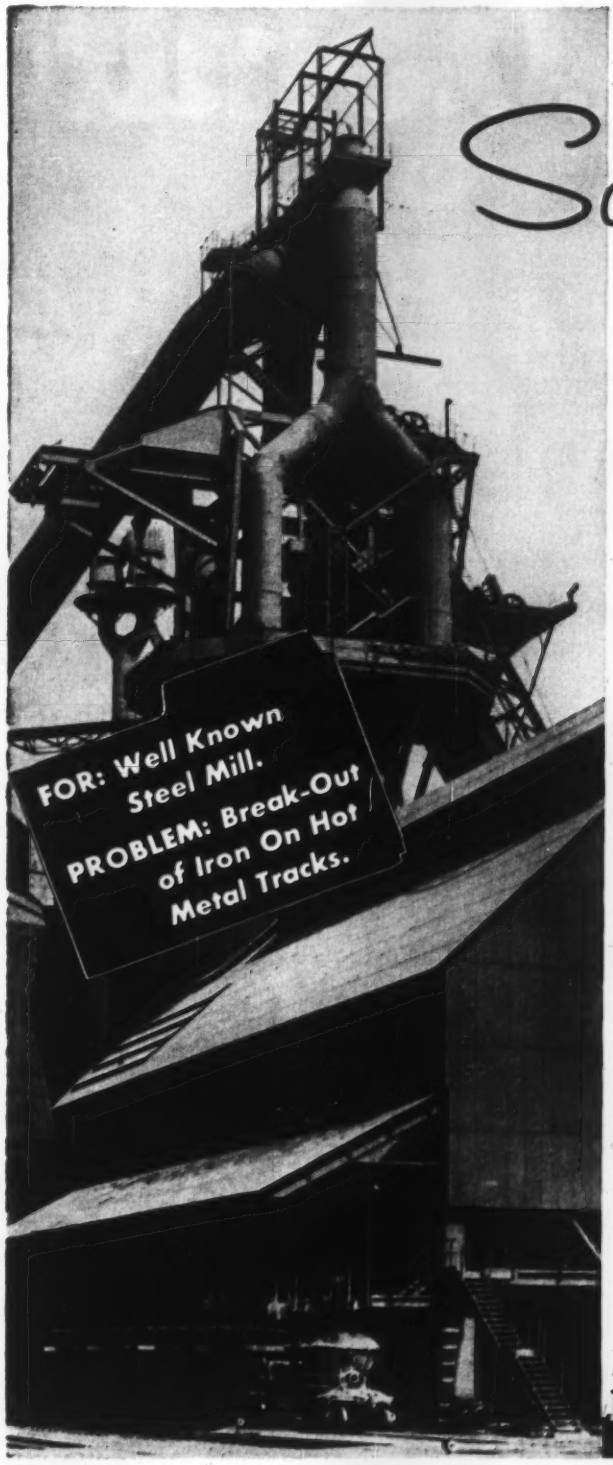
REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 15, ONTARIO

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

CHICAGO CONCRETE ON THE JOB IN HOURS



Saved

40 HOURS OF PRODUCTION

"WE THOUGHT OUR FURNACE WOULD BE OUT OF PRODUCTION AT LEAST 2 DAYS . . . BUT WITHIN TWO HOURS AFTER THE BREAK-OUT CHICAGO CONCRETE WAS ON THE JOB . . . AND IN 24 HOURS WE WERE BACK IN FULL PRODUCTION," so commented the superintendent of blast furnaces at a well-known steel mill. It is another story typical of the speed that CHICAGO CONCRETE is capable of — speed that has saved customers thousands of dollars. This is the story:

At 11 P.M. we received an emergency call . . . a breakout of iron on the hot metal tracks had burned up the tracks and welded a number of railroad trucks to them. By 1 A.M. the first CHICAGO CONCRETE men were on the job. In 8 hours they had the spill cleaned up and new tracks laid. Four sets of railroad trucks were saved from the scrap-heap by the careful use of dynamite . . . a service that CHICAGO CONCRETE are experts at.

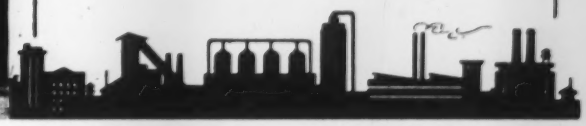
On the job faster . . . with experienced skilled personnel . . . employing the most modern equipment . . . that is CHICAGO CONCRETE'S story. You, too, can depend on CHICAGO CONCRETE in any emergency.

CHICAGO CONCRETE BREAKING CO.

12233 S. AVENUE "O", Chicago 33, Ill., BAyport 1-8400
PITTSBURGH AREA - 213 Corey Ave., Braddock, Pa., Electric 1-1656

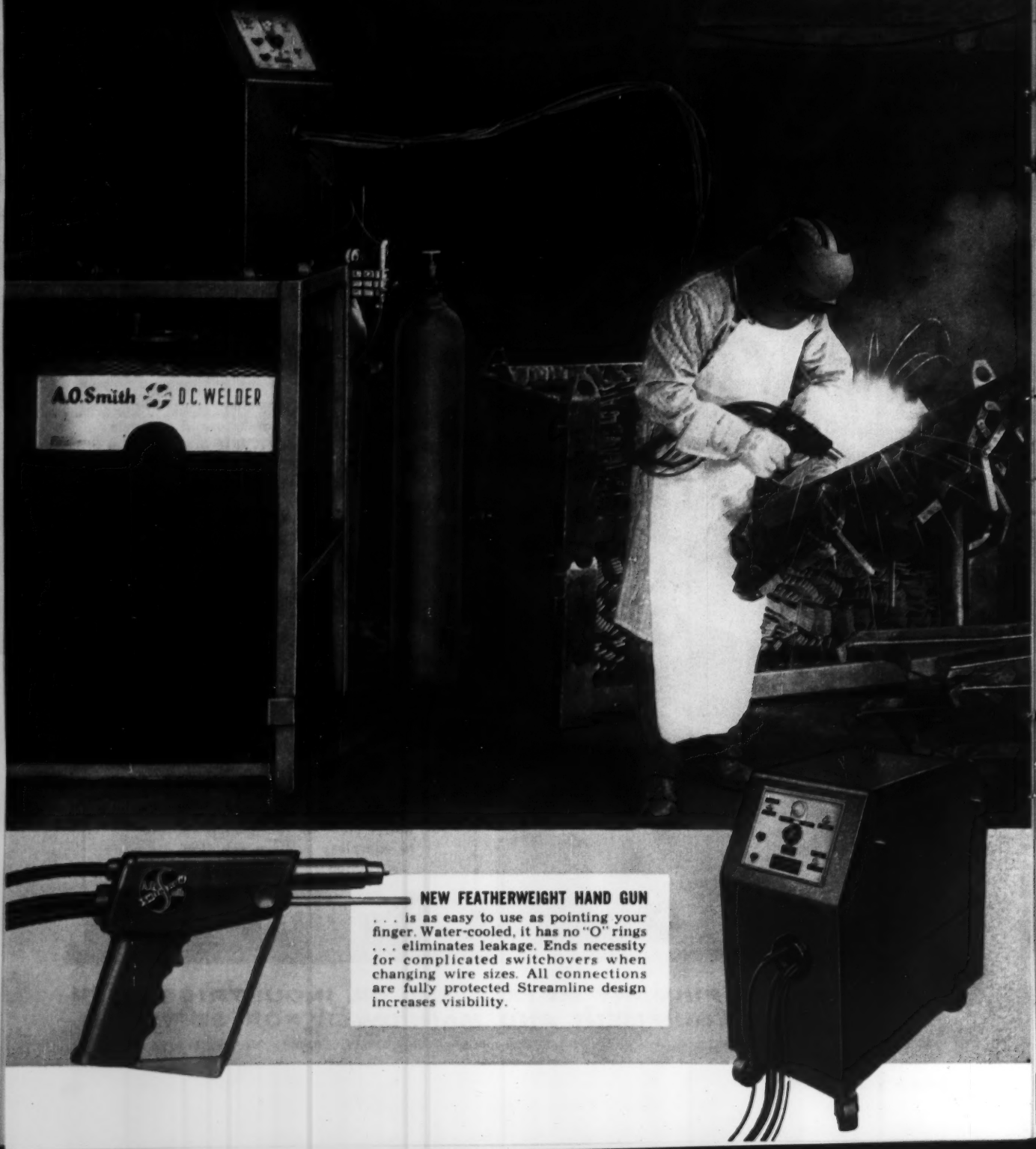
AND NOW

CHICAGO CONCRETE CONSTRUCTION COMPANY offers a complete industrial construction service . . . handling anything from minor masonry, steel or foundation repairs to complete furnace rebuilds.



SERVING THE PRIMARY METALS AND OIL INDUSTRIES WITH KNOW HOW, EQUIPMENT AND MANPOWER FOR 35 YEARS

All New... A.O.Smith



NEW FEATHERWEIGHT HAND GUN

. . . is as easy to use as pointing your finger. Water-cooled, it has no "O" rings . . . eliminates leakage. Ends necessity for complicated switchovers when changing wire sizes. All connections are fully protected Streamline design increases visibility.

C-OMANUAL

Carbon Dioxide Hand Gun Welding

...offers amazing economy and high degree of automation!

★ **Cuts gas cost to practically nothing!**

1¢ per cubic foot for carbon dioxide as compared to almost 7¢ for Helium and 9¢ for Argon... and you use much less. Savings in gas alone will more than pay for your C-OMANUAL unit in several months.

★ **Clean slag-free welds!**

No flux to clean, no chipping, no scraping.

★ **Fast, fast, fast!**

Several times faster than the fastest stick electrodes... as fast, or faster than any semi-automatic process in existence.

★ **Visible arc**

Keeps you in the groove... assures consistent weld quality. Speeds spotting of nozzle.

★ **New simplicity of operation**

There's no constant fiddling with settings. Console automatically controls arc length... compensates for operator's arc distance variations.

★ **Deeper penetration**

Assures sound, uniform welds with excellent strength and ductility.

COMPACT, EASILY PORTABLE CONTROL CONSOLE

Mounted on free-rolling rubber casters, the control console is easy to move from spot to spot. It contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections — *plus the exclusive two-speed head* which allows operator to get proper feeds for light or heavy wire by mere flick of selector switch. Controls on front panel are conveniently grouped, easy to read.

Through research ... a better way

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.

New Style KSDN Kendex Tool designed for turning, profiling and chamfering in either direction

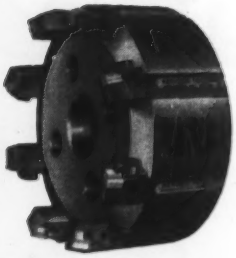
KENDEX* turnover "throw-away" principle adaptable to many special cutting jobs

Quick, accurate indexing . . . fast tool changes . . . *no* costly grinding . . . all of which add up to higher production with lower tool investment and minimum maintenance costs.

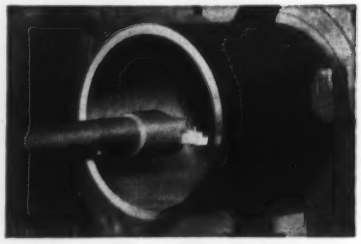
These are the Kendex advantages that have resulted in adaptation of Kendex to many *special* job applications; odd job milling, step milling, face milling, and boring, chamfering, turning, and profiling operations. A few adaptations of the Kendex design principle to varied cutting problems are illustrated.

But, no matter if it's a special or a standard machining operation, Kendex Tooling provides many distinct advantages. In addition to quick, accurate indexing, without resetting the toolholder, and the elimination of all grinding, Kennametal* "throw-away" button inserts reduce machine down time and speed up production.

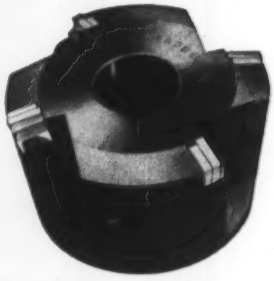
Why not let a Kennametal tool engineer help you select the right Kendex Tooling for each job . . . special or standard. By training and experience, he is qualified to analyze tooling problems and recommend right solutions. Or write KENNAMETAL INC., Latrobe, Pennsylvania.



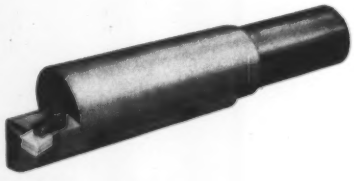
Eight standard Kendex Tools adapted to odd job milling



Boring bar equipped with standard Kendex Tooling



Special 4-step boring head with adaptation of standard Kendex "throw-away" inserts and clamp mechanism



A standard Kendex Tool fitted to a special bar

*Registered Trademark

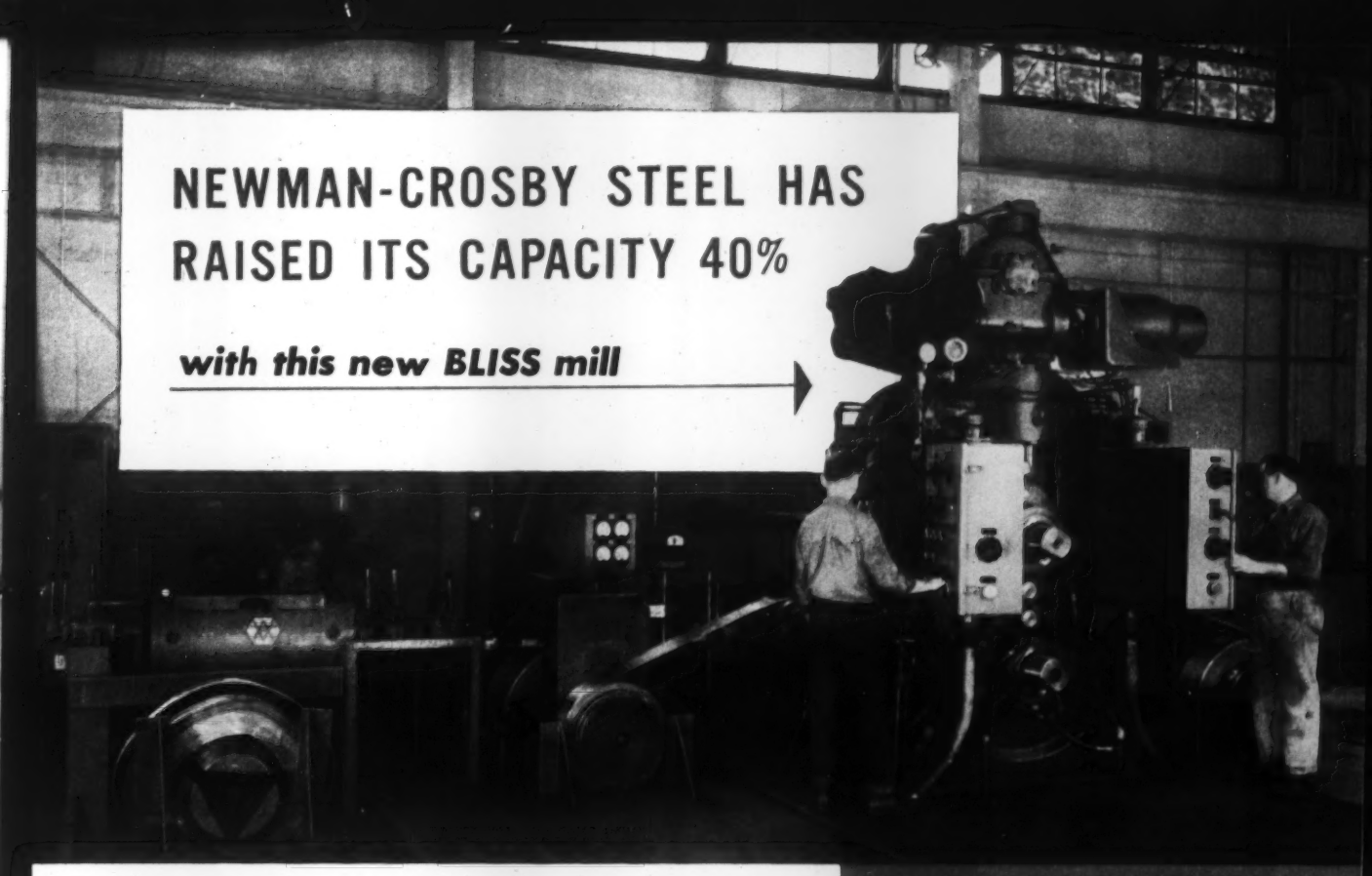
MINING, METAL AND WOODWORKING TOOLS
WEAR AND HEAT-RESISTANT PARTS

INDUSTRY AND
KENNAMETAL
...Partners in Progress

ABRASION, CORROSION-RESISTANT PARTS
PERCUSSION AND IMPACT PARTS

NEWMAN-CROSBY STEEL HAS RAISED ITS CAPACITY 40%

with this new BLISS mill



Like many another metal producer, Newman-Crosby Steel Company is betting confidently on the continued healthy growth of the American economy! This Rhode Island producer of close-gage cold rolled strip has just raised its capacity a good 40% by installing a new Bliss 4-high reversing mill, as well as new coil-handling and heat-treating facilities.

The 6½″ and 16″ x 14″ mill is used to roll high-carbon and alloy spring steel in gages between 0.125″ and 0.010″, in widths up to 12″ and at speeds to 800 fpm. In actual operation all these design specifications have been exceeded. Bliss also designed and built the coil-handling facilities, including the two tension reels and coil buggies and the pay-off reel. Maximum limit on coil weight is 6,000 pounds.

An unusual roll drive arrangement permits wide flexibility in the choice of roll diameter. Roll speeds are synchronized electrically rather than through gears. Thus, even unmatched roll diameters can be used together successfully.

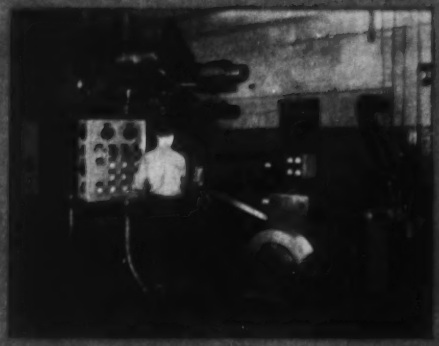
Building mill equipment to meet special needs . . . or to perform standard operations more efficiently . . . is an important reason why Bliss has become a leader in the field. If you would like more information on Bliss mill innovations, as well as details of many Bliss installations, write us today for a copy of our 60-page Rolling Mill Brochure, Catalog 40-A.

E. W. BLISS COMPANY
General Office: Canton, Ohio
ROLLING MILL DIVISION
SALEM, OHIO

BLISS
SINCE 1857

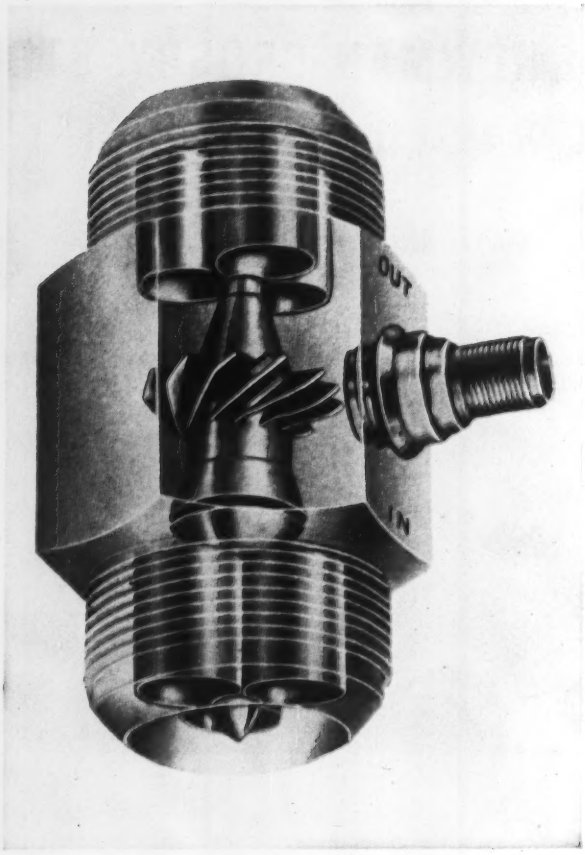
is more than a name...
it's a guarantee

The new mill has already outperformed most of the specifications set for it, rolling strip thinner, wider and faster than its original objectives of 0.010-inch gage, 12-inch width and 800 fpm speed.



Another view of the unusual new mill. Elimination of geared roll drive adapts it to use with wide variety of roll diameters to suit different rolling problems.

PLANTS: Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Pittsburgh and Midland, Pennsylvania; San Jose, California. In Europe: E. W. Bliss (England) Ltd., Derby; E. W. Bliss (Paris), France.



Designing parts from *Carpenter* Stainless No. 20 helps tame corrosive rocket fuels

Internal parts of "flow sensing" units which control the flow of fuel to rocket engines, must combine super corrosion resistance and mechanical durability. They meter liquid oxygen at —297°F and a 90-98% concentration of red fuming nitric acid. That's why these critical parts were designed with the super corrosion resistance of Carpenter Stainless No. 20, and machined from No. 20 bar stock.

The units measure fuel flow accurately to within 1/10 of 1%. Yet they are so durable that when rocket experts dig wrecked missiles out of desert sands they recover the units for re-use.

When you design parts, components or complete pieces of equipment for handling sulphuric acid or other strong corrodents, consider the economy of designing with this super corrosion-resisting stainless.

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor . . . or write direct for full information on the cost-saving advantages of Carpenter Stainless No. 20.

Carpenter Stainless No. 20 Cb is available from The Carpenter Steel Company, Alloy Tube Division, Union, New Jersey, in the forms of tubing, sheet, strip, pipe and plate; and Stainless No. 20 in the forms of bars, billets and wire.

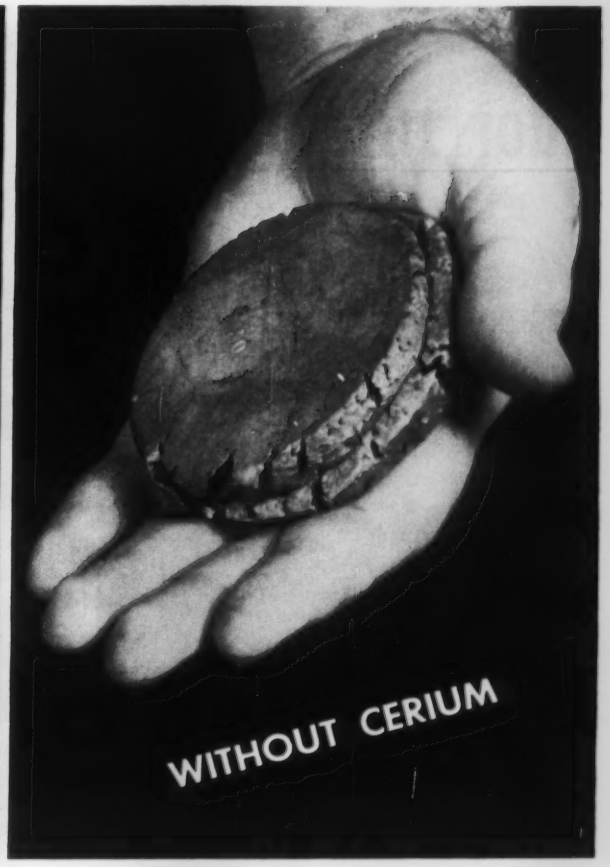
Carpenter STEEL

Super Corrosion-Resistant Stainless

Pioneering in Improved Tool, Alloy and Stainless Steels through Continuing Research

The Carpenter Steel Company, 139 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"



HOW *Carpenter* USES RARE EARTH ELEMENTS TO IMPROVE FORGEABILITY OF ALLOYS FOR ELEVATED TEMPERATURE SERVICE

The value of rare earth elements in certain alloys for elevated temperature service can be seen in this hot forgeability test. Cast cones, identical except for the addition of cerium in one, are heated to forging temperature and upset or hammered into flat "pancakes". Note the relative freedom from cracks and tears in the specimen containing cerium.

What does this improved hot workability mean to you? It means better forged finishes requiring less machine clean-up . . . less wasted steel . . . fewer rejects . . . faster fabricating.

Carpenter alloys for elevated temperature service have an enviable reputation for improved forgeability, and exceptional cleanness which meets the strictest inspection requirements.

Carpenter pioneering in tool steels, super corrosion resisting steels and free-machining stainless steels has helped hundreds of companies to improve products and cut costs. This same specialty mill experience can help you do a better, low cost job on any parts or products you make for high temperature service. It'll pay you to investigate. Contact your Carpenter Representative, or drop us a line on your company letterhead. *The Carpenter Steel Company*, 139 W. *Bern St., Reading, Pa.*

Specify Carpenter alloys for elevated temperature service and get these three big advantages . . .

Improved Forgeability
Greater Uniformity
Cleaner Steel

Carpenter STEEL

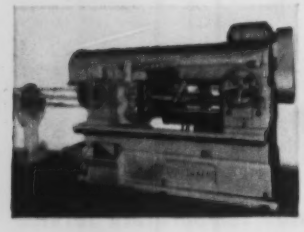
Improved Alloys for Elevated Temperature Service

61 models

A machine not put to its best use is theoretically idle. Proper machine selection is an important factor in the profitable use of a multiple spindle automatic. So extensive are the demands on this type of lathe that no single model—or number of models—can be expected to efficiently handle the wide range of work available.

To excel in any range of work a multiple spindle automatic must be specifically designed for that range. That is why CONOMATICS are provided in so many models. In no other way can the purchaser be assured of the best possible machine for his particular requirements.

Write for your copy Today

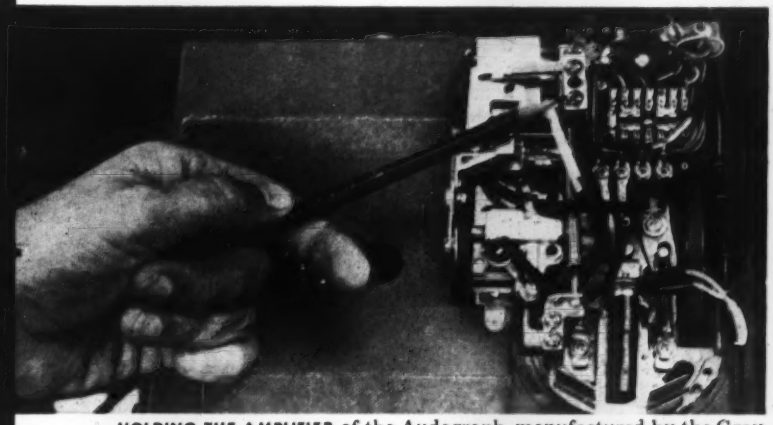


Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

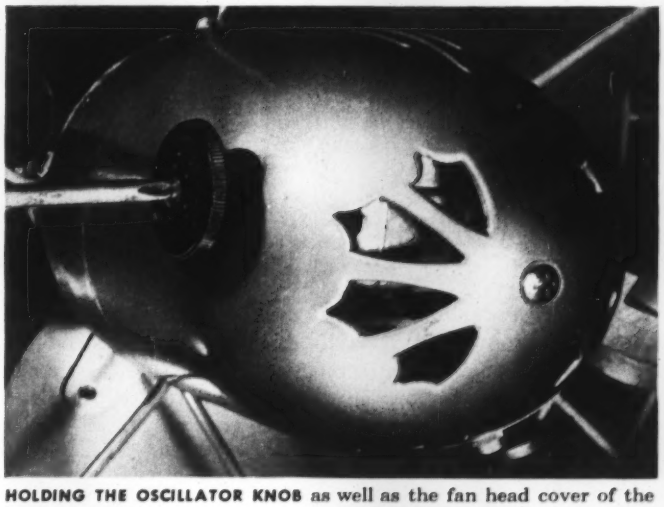
PHILLIPS CROSS RECESSED HEAD SCREWS

are holding down many important jobs



HOLDING THE AMPLIFIER of the Audograph, manufactured by the Gray Manufacturing Company, there are Phillips screws. Mr. William Sherman, Director of Sales, says, "Phillips screws enable us to meet the rugged performance standards required of the Audograph machine and to meet our competition in the dictation field."

HOLDING THE pro-SURE-tool of the Buchanan Electrical Products Corporation, are four Phillips screws. "By switching to Phillips screws we accelerated production, prevented driver slippage, increased the torque applied to each screw and eliminated the unattractive 'chewed up' screw head," says Mr. Mittleman, Plant Superintendent and Production Manager.



HOLDING THE OSCILLATOR KNOB as well as the fan head cover of the Fasco Industries, Inc., fans, you'll find Phillips screws. Mr. Weiland, Assistant Purchasing Agent of the company says, "When we introduced Phillips screws, we immediately improved assembly. They also eliminated burring and improved the appearance of Fasco fans."

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY...
AND OF THE FUTURE
X marks the spot
the mark of extra quality

Pledged to highest standards...

The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

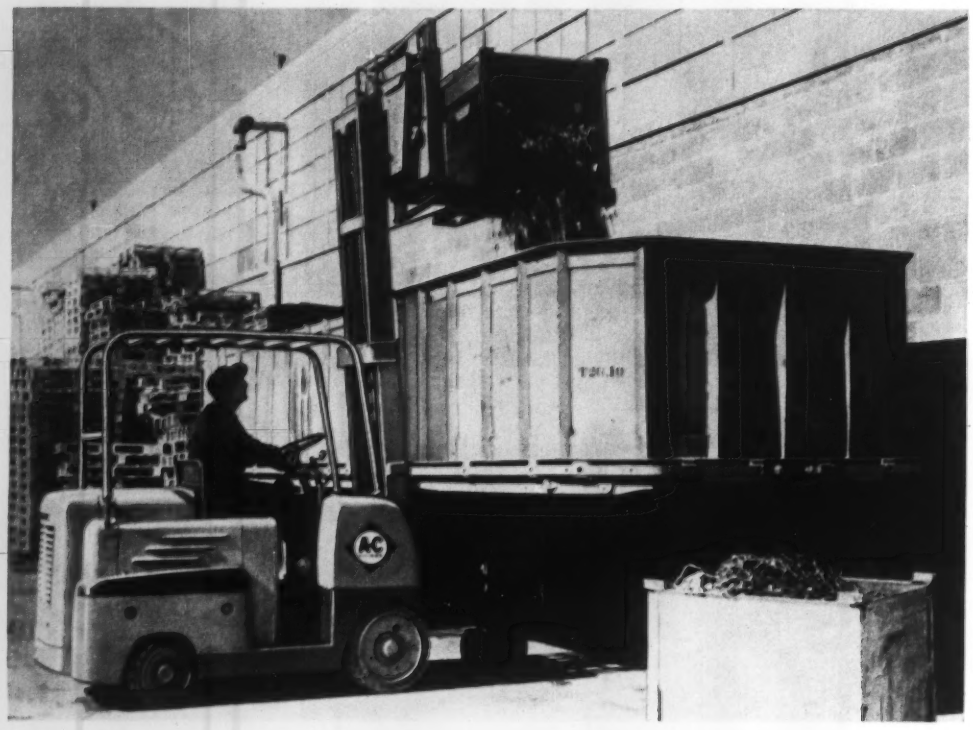
Members of Screw Research Association

American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Co. Elco Tool and Screw Corporation • Great Lakes Screw Corp. • The H. M. Harper Company • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Company • Parker-Kalon Division, General American Transportation Corporation Pheoll Manufacturing Co. • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hdwe. Mfg. Company • Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation

PLAY IT SAFE..

Choose Allis-Chalmers Fork Trucks

for Both Profit and Protection!



"It is impossible to estimate the value of this fork truck in improved safety and in manpower saved," says owner. The Allis-Chalmers 6,000-lb truck has 360° rotater and torque converter drive, clears scrap from around presses and hauls it 300 ft to scrap area at Carrick Products Co., Detroit.

See us at the
NATIONAL METAL EXPOSITION
Cleveland, Oct. 8-12
Booth 2509

Users say that Allis-Chalmers fork lift trucks are the most efficient and economical they ever used — *also the safest.*

It's no accident that they give you the best possible protection for your men, equipment and material handled. From strong, automotive-type main frame to top of double-channel mast, every detail has been engineered with an eye to safety. There's a wide, low mounting step on both sides leading to a roomy floorboard that is completely clear of levers. Brakes are more than ample in size and are self-energizing both forward and backward. Center of gravity is low. Fuel tank is placed far from the engine compartment. Because they drive like an automobile, the operator makes the right move by reflex in a tight spot.

You can measure the profits an Allis-Chalmers fork truck can make — and that's important. But safety is so important, it *can't* be measured. It is a big additional reason why you should specify Allis-Chalmers. For complete information, write for free catalog or obtain a copy from your Allis-Chalmers Materials Handling Dealer.

MATERIAL HANDLING DEPT., BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

BH-15A

Specify

ALLEN STAINLESS

. . . for bright, lustrous finish

. . . for high resistance to corrosion

When designs call for bright finish and ability to stand up to corrosion, you'll find the largest range of sizes in Stainless Cap Screws available anywhere right at your Allen Distributor's. He stocks 97 standard sizes in Type 18-8 Stainless Steel, from #4 x 1/4" to 5/8" x 3" with NC threads; #10 x 3/8" to 3/8" x 1 1/2" with NF threads. Diameters of No. 8 and above have genuine unthreaded Allen Leader Points, to permit easier starting. Regularly furnished with Smooth Head unless Grip Head is specified.

ALLEN

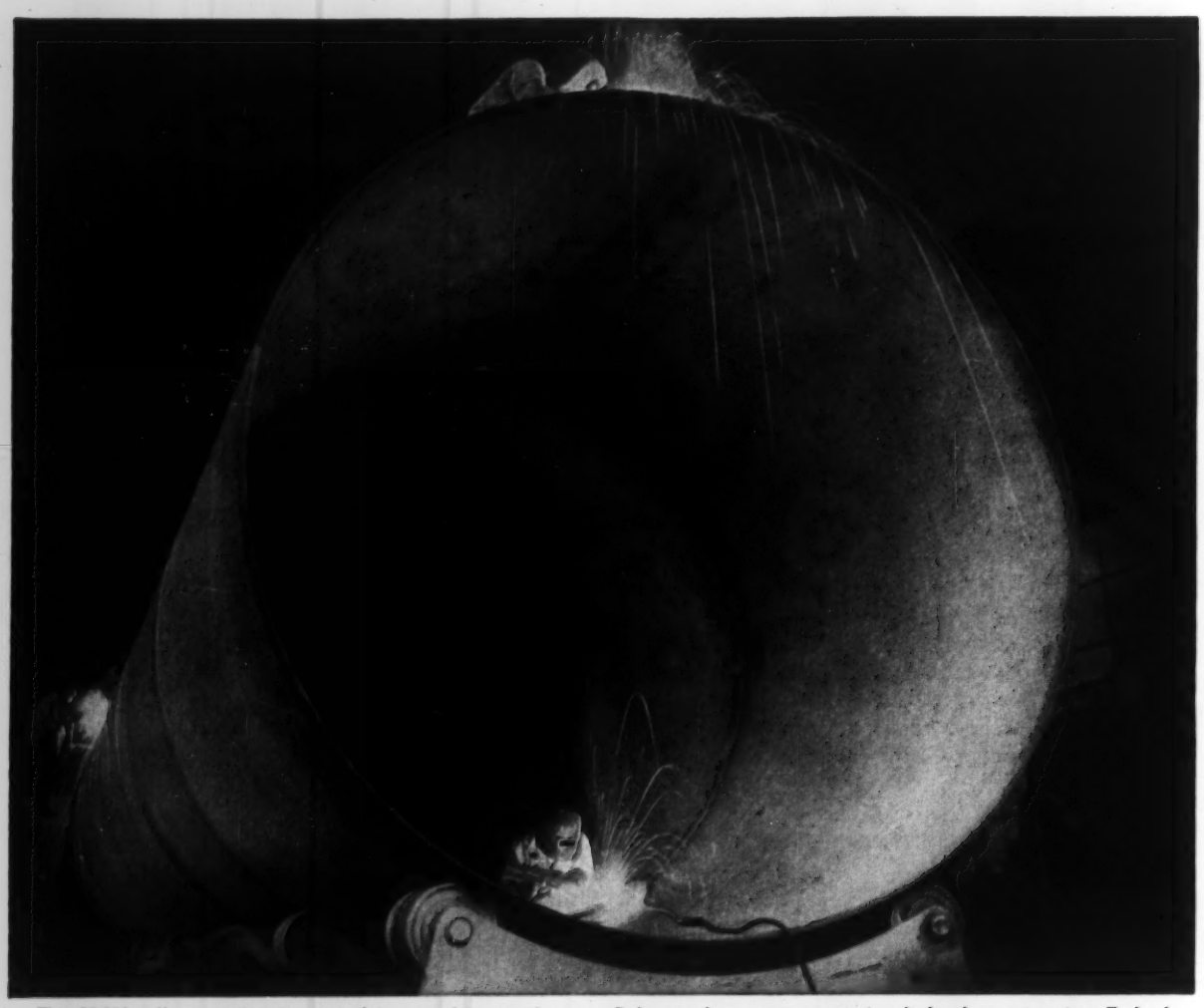
MANUFACTURING COMPANY

Hartford 2, Connecticut, U.S.A.

STAINLESS SET SCREWS

with the deep-driving, tight-holding ALLENPOINT stocked by your Allen distributor in 54 standard sizes from #4 x 1/8" to 1/2" x 1" NC threads; #10 in lengths from 3/16" to 3/4" NF threads.

Sold only through leading Industrial Distributors.



This 50,000 gallon capacity air accumulator vessel is one of many under construction by Allied Steel Products Corporation, Newport, Delaware, for a government aircraft development project. Each of the vessels is fabricated entirely of Lukens "T-1" steel.

Fabricator of giant air accumulator says:

"LUKENS HIGH YIELD STRENGTH 'T-1' WELDS EASIER THAN OTHER HIGH-STRENGTH STEELS!"

■ A strong statement—but Lukens "T-1" steel is a remarkable new material. Reports from **Allied Steel Products** say it combines strength and toughness with excellent weldability—as found in no other alloy steel. On this project, every inch of weld was subjected to X-ray inspection.

The greater strength of Lukens "T-1" steel permits reduced plate thickness for a given pressure and vessel diameter. For example, this 11-foot inside diameter air accumulator's shell is only 1¼" thick, and the unit will be hydrostatically tested for a minimum working pressure of 585 psi. Operating temperatures will range from −20° to +125°.

Needless to say, Allied Steel Products looks forward to using Lukens "T-1" steel on other assignments in the very near future.

If your problem is equipment weight . . . abrasion, impact or atmospheric corrosion . . . the need for toughness at temperature extremes—it will pay you to investigate this amazing new alloy steel now.

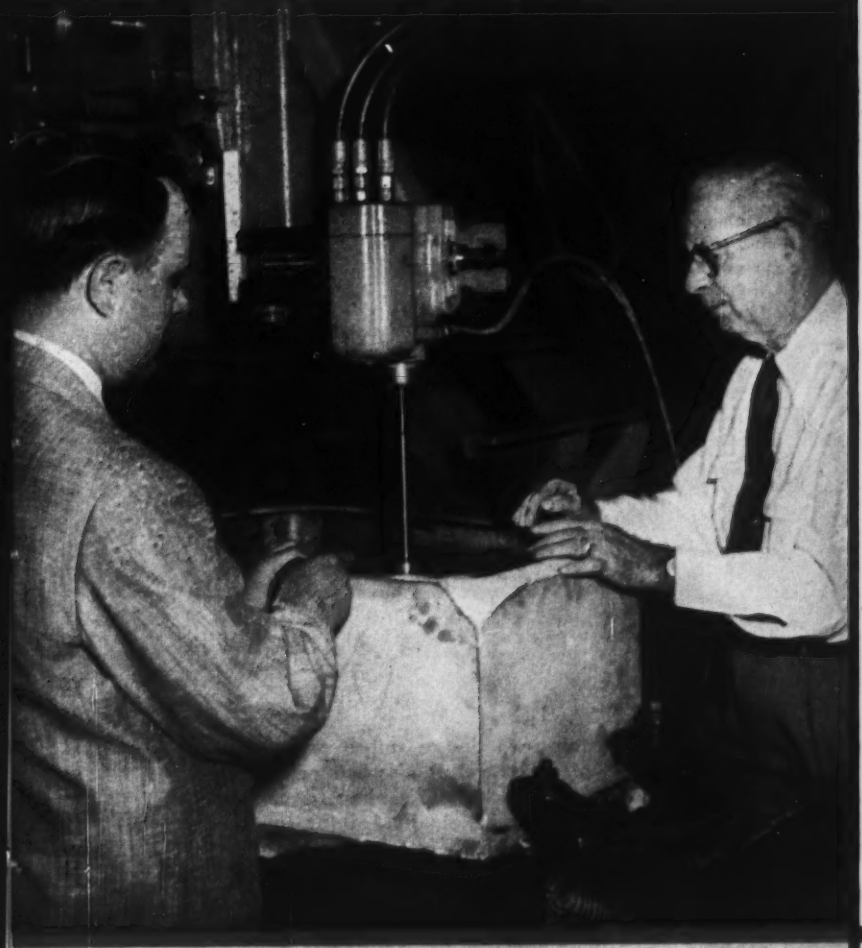
For the latest in fabrication techniques and specifications, write to Manager, Marketing Service, 847 Lukens Building, Lukens Steel Company, Coatesville, Pennsylvania.

LUKENS "T-1" STEEL

LUKENS

THE NEWEST IN A COMPLETE LINE OF ALLOY STEELS
LUKENS STEEL COMPANY, COATESVILLE, PENNSYLVANIA

STANOIL *Industrial Oil*
tough performer in delicate operation



A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off for them.

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

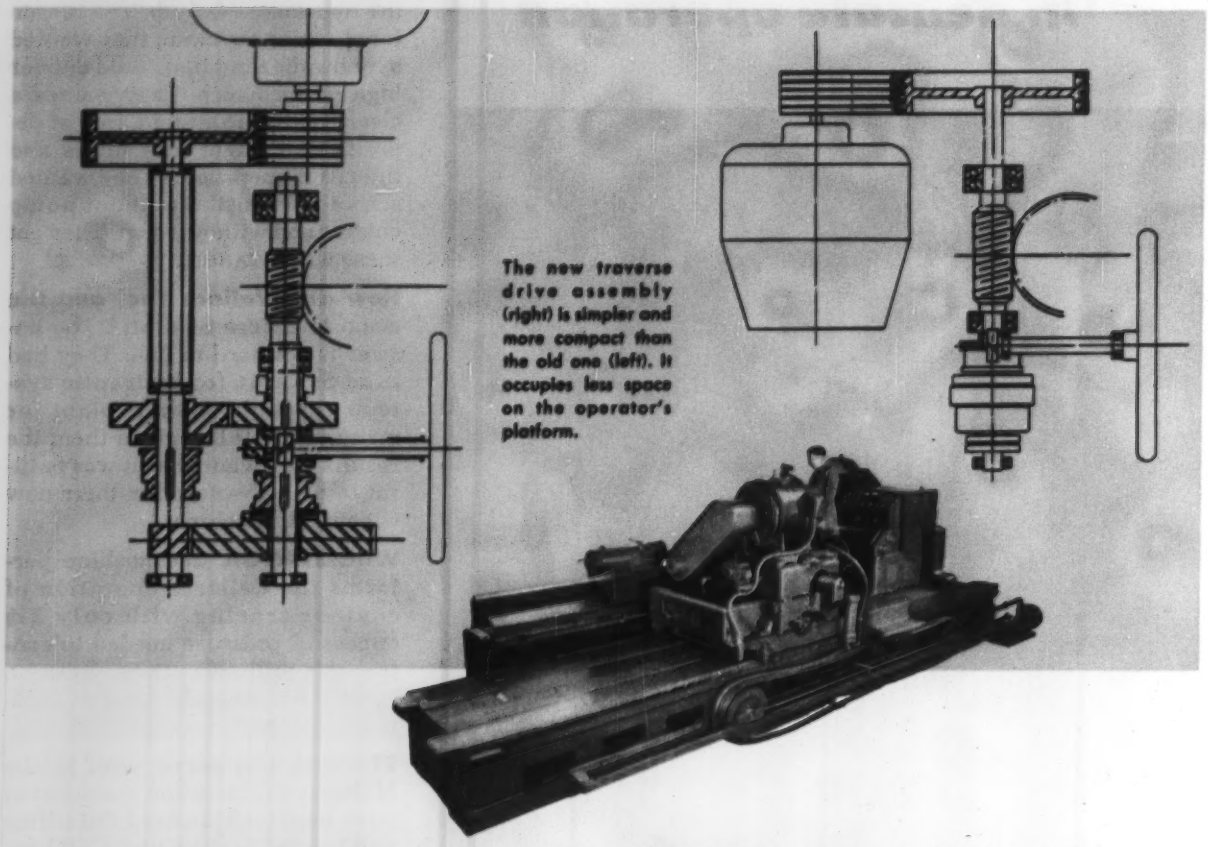
With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)

Meet a solid reason why Farrel® H-D roll grinders are better than ever



The new traverse drive assembly (right) is simpler and more compact than the old one (left). It occupies less space on the operator's platform.

Accurate, fast, economical and easy to handle—that's the reputation of Farrel heavy duty roll grinders. And now . . . with the addition of a number of significant design improvements . . . overall performance of these popular machines is even better.

Take the new carriage traverse drive, for example. It is an adjustable-speed, packaged power unit, with the entire speed range governed by a rheostat. Speed-change gears and clutches, which were previously required, have been eliminated.

This simplified design improves operating control of the traverse; also reduces maintenance. What's more, the cabinet for the new drive is considerably smaller, giving the operator more space on the platform.

Write for full details of this and other features of the improved Farrel HD grinder.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N.Y.
Sales Offices: Ansonia, Buffalo, Akron, Chicago, Fayetteville (N. C.), Los Angeles, Houston

FARREL METALWORKING MACHINERY

Rolls • Rolling Mills • Slab, Rod and Strip Handling Equipment • Roller Tables • Rod Coilers • Slitters • Gears • Gear Drives of Any Capacity • Mill Pinions • Pinion Stands • Universal Mill Spindles • Flexible Couplings • Roll Grinding Machines • Roll Calipers • Hydraulic Presses for Extruding, Forming, Drawing, Forging, Trimming, Hobbing, Straightening and Bending.

Farrel-Birmingham®

FB-1085

ARCOS announces . . .

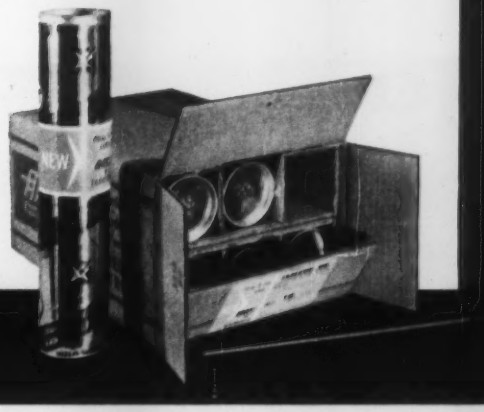
new easy-to-use DC electrodes

THE AEROCOR SERIES

Especially developed for DC reverse polarity welding of stainless sheet metal. Available in the following types: 308, 309, 310, 316, 347, 349, 410; sizes $\frac{1}{16}$" to $\frac{1}{8}$" dia.

THE FABRICOR SERIES

Especially developed for DC reverse polarity welding of heavy stainless. Available in the following types: 308, 309, 310, 316, 347; sizes $\frac{3}{32}$" to $\frac{1}{4}$".



Good news for every user of stainless electrodes

AEROCOR and FABRICOR identify America's newest DC welding electrodes.

To users they offer an opportunity for faster, easier welding. They've been especially designed for quality welds with the benefits and properties you want most.

For example, on every job, AEROCOR and FABRICOR Electrodes offer you these advantages:

- **Excellent arc action**
- **"Drag-type" welding technique**
- **Little or no spatter**
- **Superior washing action—good contours, sound penetration**
- **Smooth, even-rippled weld beads**
- **Slag that chips off quick and easy**

AEROCOR and FABRICOR are manufactured to the same high standards as all ARCOS Stainless Electrodes. And they're packaged in the famous Arcos ELECTROPAK — the easy-to-open-and-reseal container that protects against moisture pick-up and chipped coatings. Both series are identified by a bright orange colored label. Available through your Arcos representative or distributor.

FREE PERFORMANCE TEST

See the results in your own plant. Compare the performance of these new ARCOS Electrodes to what you're now using. Just drop us a line on your company letterhead and we'll arrange a demonstration. No obligation, of course.

More than ever it pays to . . . **WELD WITH** ARCOS

ARCOS CORPORATION • *1500 South 50th Street • Philadelphia 43, Pa.*

"We bought a 20-ton Lectromelt* Furnace for inventory control,"

says Rotary Electric Steel

Their five big furnaces run a minimum of 60 tons each

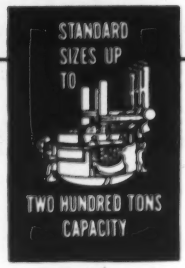
● 15 to 30-ton lots of stainless steels can be produced in a hurry in this new Lectromelt furnace. That enables Rotary Electric Steel Company of Detroit to offer prompt delivery when certain of these special steels are out of stock.

Precise quality control and constant checking of the steel at each processing step are basic in Rotary's production. The ease with which alloys can be adjusted and the speed with which Lectromelt furnaces can be put to work makes them well suited to these policies.

Lectromelt furnaces for melting and refining are described in Catalog 9-B. For a copy, write Lectromelt Furnace Company, 323 32nd Street, Pittsburgh 30, Pennsylvania (a McGraw Electric Company Division).

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagova

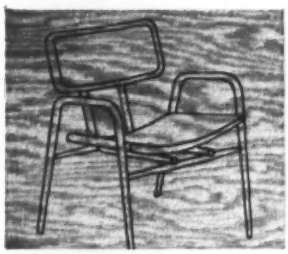
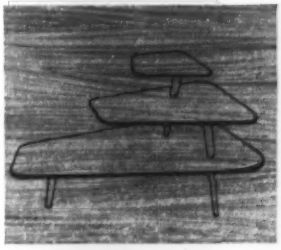
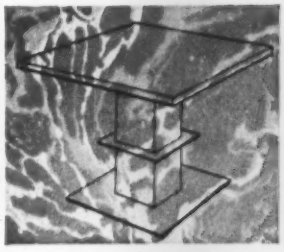
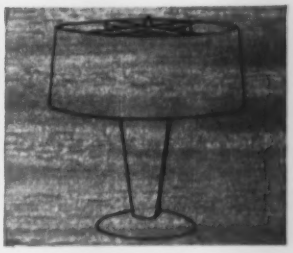
*REG. T. M. U. S. PAT. OFF.



WHEN YOU MELT... *Lectromelt*

RIGIDIZED TUBING BY STANDARD

customized for you in "1001" patterns

For volume users of tubing—

Hundreds of exciting new patterns in rigidized tubing can be made up to add novel beauty, strength and individuality to your products. Textures and motifs to match fabrics, woods, materials and finishes of all kinds. In round, square, rectangular or special shaped tubing. And manufacturer sharing the cost of design development depending, of course, on volume of order. Custom patterns such as—nubby weaves, rustics, striateds, knotty pine, corrugated, herring-bone, ripple wood, swirls, scrolls, geometrics—can be designed to your specifications. Gleaming chrome or duo-tone enamel finishes. Unlimited pattern designs! Unlimited uses! You are limited only by your own imagination. Sizes range from ½" to 5½" OD in 16 gauge and lighter carbon steel tubing . . . and to 4" OD stainless steel.

Standard also offers full line of carbon and stainless tubing and pipe—for everything from simple *structural* to precision *mechanical* and *pressure* applications.

FREE 8-page folder on all Standard products. Write to address below.

STANDARD

THE STANDARD TUBE COMPANY

24400 PLYMOUTH ROAD • DETROIT 39, MICHIGAN

Welded stainless tubing and pipe • Welded carbon steel mechanical • Boiler and Heat Exchanger • Exclusive rigidized patterns • Special Shapes • Steel Tubing—Sizes: ½" OD to 5½" OD —.028 to .260 wall • Stainless—Sizes: ¼" OD to 4" OD—.020 to .154 wall.

It's not always possible to launder *all* the chips or filings out of ordinary wiping material. Chips come back to scar men and metal, to plague your production line. This man has already had four wiper cuts.

He had 4 wiper cuts last month

They're easy to distribute . . .

They really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

Chips can't hide in a clean Scott Wiper. Each Wiper is brand new, fresh from the carton. A man takes a Scott Wiper as he needs it . . . uses it for his face, his hands, his product.

...He had none!

The difference is . . . Scott Wipers

This is sanitary wiping. A man uses a Scott Wiper thoroughly, throws it away—takes a new one. No danger of cuts from hidden chips . . . no fear of skin infection from dirty wipers . . . when you take a fresh wiper from the carton.

And because Scott Wipers are disposable you save in many other ways. Sorting and baling are eliminated. Handling and distribution are simplified. Laundering becomes a thing of the past.

Your local Scott representative or distributor is ready to demonstrate in your plant any time you say. Call him or mail this coupon right away.

Another quality product of . . .

SCOTT PAPER COMPANY

Scott Paper Company
Dept. W-5, Chester, Pa.

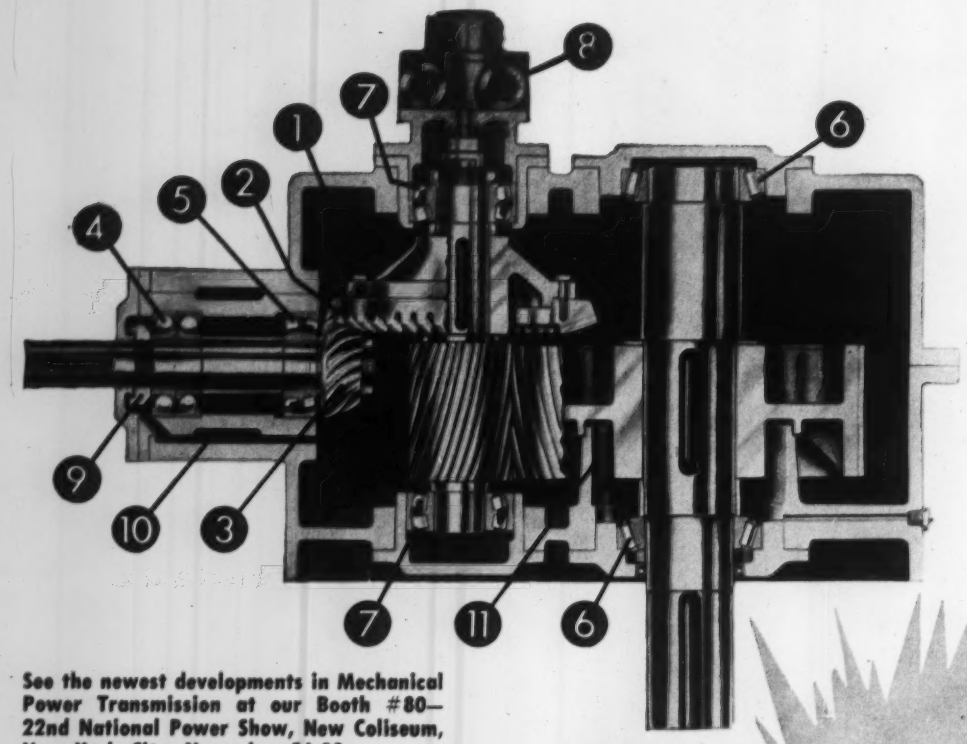
Please send me more information about Scott "Throw Away" Wipers.

Name _____

Company _____

Position _____

Address _____

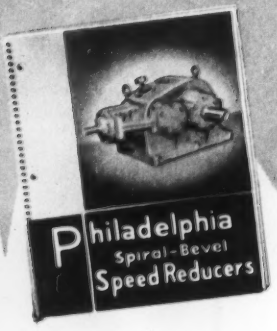


Sectional view of a Double Vertical Type Philadelphia Spiral-Bevel Speed Reduction Unit.

See the newest developments in Mechanical Power Transmission at our Booth #80— 22nd National Power Show, New Coliseum, New York City, November 26-30.

PUT US "ON THE SPOT"

Send For This "Text Book"



. . . make us tell you the "11 points" of superiority of PHILADELPHIA SPIRAL-BEVEL REDUCERS

These units offer a compact, dependable and highly efficient means of transmitting power at right angles. They are available for Vertical (shaft-up, or shaft-down) or Horizontal Mounting; in single, double or triple reductions . . . Reduction Ratios range from 1.5 to 1 up to 238 to 1.

Due to their unique design and construction, they require no separate cooling system, and as can readily be seen, they are very accurately and ruggedly built . . . Thousands are in use throughout industry, driving vital equipment day and night, year-in and year-out.

Yes, we'll be glad to have you "put us on the spot" by asking a Philadelphia Sales Engineer to call, or by asking for our complete 88 page catalog SB-50.

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ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

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INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

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COLD-ROLLED SPRING STEELS

WALLACE BARNES STEEL DIVISION

ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

ALSO MAKERS OF SPRINGS — WIRE FORMS — SMALL STAMPINGS

(Advertisement)

Facts to consider when you're buying

Chromate Conversion Coatings

for Corrosion Protection, Paint Base, Decorative Finishing

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002″ max.) gel-like, complex chromate film of a nonporous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

If your company is manufacturing or buying parts or complete assemblies made from or plated with any of the more common non-ferrous metals—zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze—you've probably already run up against the question of finishing these surfaces with a chromate conversion coating. These coatings are used to protect against corrosion, or to provide a base for paint or to provide a decorative finish for sales appeal or shelf life. Since chromate conversion coatings represent a relatively new means of obtaining these finishes, this digest of facts to consider may be of value to you.

1. THE COATINGS THEMSELVES. There are many brands on the market. All are similar in many ways. Each, of course, offers its own specific advantages and these may relate to operating techniques, performance under actual use conditions, cost, availability, etc. Naturally, you'll want to choose a coating that is widely known and accepted under both military and civilian specifications.

2. THE COMPANY BEHIND THE PRODUCT. Is it a reliable, established organization? Does it offer experienced technical service, both from the field-engineering organization as well as the home office and laboratories? The man who sells and services your installation should be thoroughly familiar with not only chromate conversion coatings and their applications, but also with the characteristics and performance of related finishing operations such as precleaning, electroplating, painting, etc. This is most important since all steps of the finishing cycle must be functioning properly for the satisfactory performance of the ultimate finish produced.

3. AVAILABILITY OF THE PRODUCT. Ideally, of course, the material should be readily available to you from nearby warehouses to avoid time loss in long distance shipping and to provide emergency service, should the need arise.

4. COST. Naturally, the initial price of the material is important to you. However, just as you consider ultimate cost when you are buying mechanical equipment, ultimate cost must be considered for these finishing chemicals. So, it will pay you to investigate consumption costs, labor costs and the other factors which go into the determination of ultimate cost. Further, cost alone gives no indication of product performance, so careful attention must be given to the purpose the finish must serve and the value that finish will add to your product.

5. FACILITIES FOR RESEARCH AND DEVELOPMENT. Perhaps the existing types of chromate conversion coatings do not include a compound that will accomplish exactly what you wish. Then, it is important to deal with a supplier who has adequate research and development facilities available to work with you to produce a material to meet your needs. Naturally, such a project is seldom completed overnight. But, with complete cooperation and confidence from both you and your supplier, chances are a satisfactory program can be completed.

These are the concepts of sales and service on which we, Allied Research Products, Incorporated, have developed and marketed the line of Iridite chromate conversion coatings . . . superior product performance, complete sales and technical service, easy product availability, economical cost, extensive research and development facilities. No doubt you are familiar with our line and have seen this trademark—

IRIDITE®

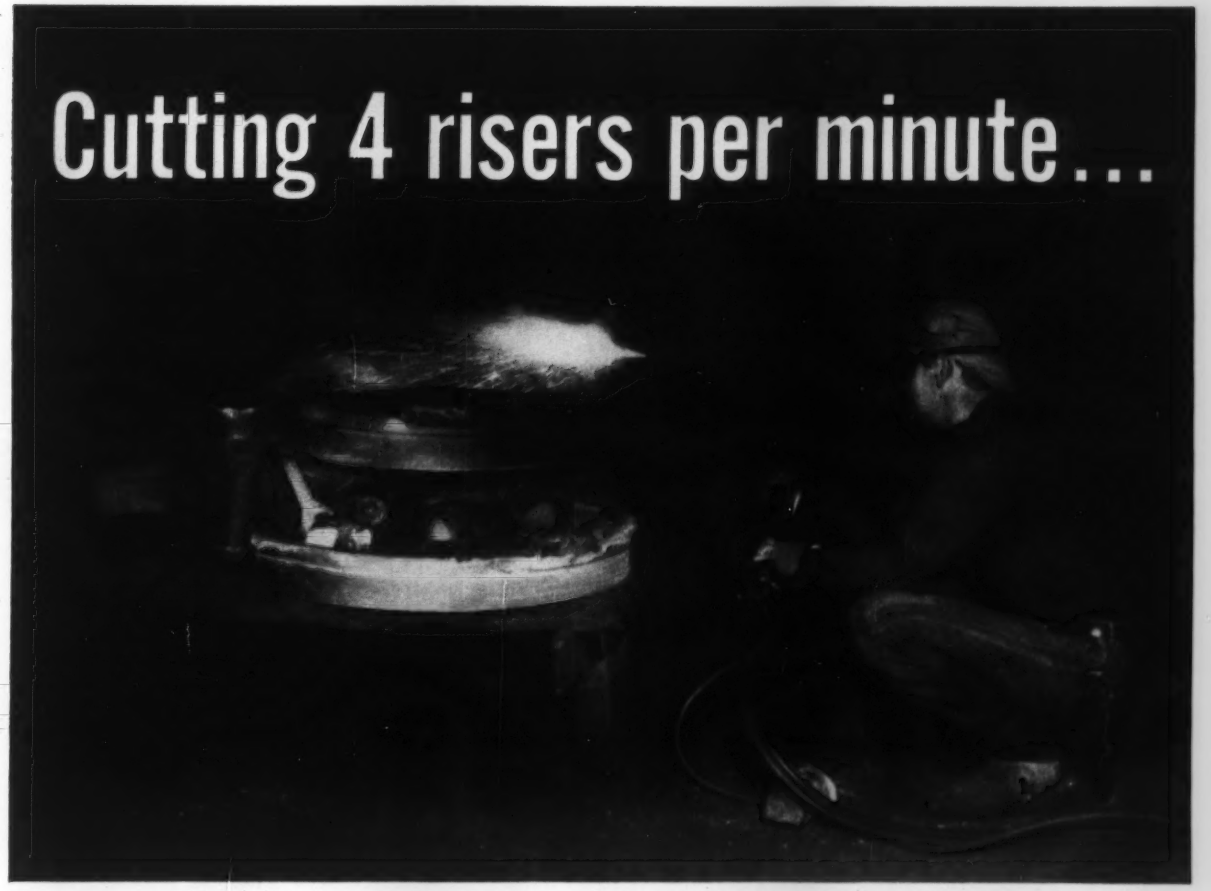
—in our advertising, technical literature or on shipping containers in your plant. Remember this trademark when you're buying or investigating chromate conversion coatings for your company. It's your assurance of quality, economical products from a reliable and established company, skilled sales and technical service from both our home office and a national network of representatives, immediate availability from warehouses in strategic industrial areas and our willingness to work with you to develop new finishes to meet your needs, should the present line fall short.

For complete information on Iridite chromate conversion coatings, write today for your free copy of our technical data file. Or, for immediate advice, call in your Allied Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

Manufacturers of Iridite chromate conversion coatings for corrosion resistance, paint systems, final finishing of non-ferrous metals; ARP Plating Brightener & Chemicals. West Coast Licensee—L. H. Butcher Co.

Cutting 4 risers per minute...



Lightweight and easy to handle, this OXWELD powder-cutting blowpipe makes fast work of risers.

Powder-Cutting speeds removal operations 300%

Removing risers from stainless steel castings need no longer be costly and time consuming. Pictured above is a typical powder-cutting operation at the Ohio Steel Foundry Company, Springfield, Ohio. Here, 2 by 4 inch thick stainless steel risers are removed by powder-cutting in only 15 seconds. By methods previously used, this operation took up to four times longer.

In the powder-cutting process metal powder is automatically injected into an oxygen flame to increase the flame's heat and severing action speed. The powder process is helping users gain new efficiency and speed in the removal of gates and risers, sand incrustations, and casting defects.

The powder-cutting blowpipe used in this operation, an OXWELD AC-4, is designed for hand cutting of oxidation resistant metals such as stainless steel, chrome alloys, and cast iron. Heavier apparatus is also available for manual and mechanized operations.

Increase your production and profit—call your local LINDE representative, or write for illustrated literature on LINDE's modern processes. Start saving now, do it today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

"Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Check your AIM*. . . Fuller Manufacturing Company did . . .

Strapping transmissions saves money, speeds handling

Acme Idea Man, Chuck Deerwester, cooperated with Fuller Manufacturing Co. in adapting this steel strapping idea.

ACME STEEL STRAPPING helped Fuller Manufacturing Company, Kalamazoo, Michigan, eliminate costly crating and slow manual handling. Now, two transmissions are steel strapped to a wooden skid, with protective top frame. This is accomplished in half the time previously required for the crating operation by the same crew. (Idea No. U6-6)

The steel strapped skid loads are moved by lift-truck, can be stacked six high. Appreciable saving in material cost and storage space are realized. And, damage in transit is reduced.

***Check your Acme Idea Man.** He will show you examples of Ideas-In-Action which are being used to solve all types of packing and shipping problems. Write Dept. SDU-106, Acme Steel Products Division, Acme Steel Company, 2840 Archer Avenue, Chicago 8, Illinois. In Canada, Acme Steel Company of Canada, Ltd., 743 Warden Avenue, Toronto 13, Ontario.

ACME STEEL STEEL STRAPPING

Production turning at 1/2 the cost!

Lodge & Shipley 10″ HI-TURN Production Lathe does job of really big lathe

...and completely outperforms any other 10″ lathe!

BIG in power and production . . . BIG in speed, in rugged construction and accuracy, the Lodge & Shipley 10″ HI-TURN Production Lathe costs only ½ the price of a good 13″ lathe used for comparable work. Here are a few of the many features that put the 10″ HI-TURN in the big lathe, big value class and put it 'way ahead of *any* 10″ lathe:

FEATURE	Lodge & Shipley 10″ HI-TURN	Lathe B	Lathe C
HEADSTOCK			
Full 5 horsepower	yes		
200 to 3000 r.p.m.	yes		
All spur gear drive	yes		
Swing over bed	13¼″		
Spindle speeds	9		
BED			
Width of bed	11⅜″		
Depth of bed	11⅝″		
Hardened, ground, replaceable bedways	yes		
QUICK CHANGE GEAR BOX			
Number of quick change feeds	9		
Range of Feeds, thous. per rev.	1.5 to 24		
CARRIAGE			
Carriage length	19⅛″		
Carriage bridge width	5⅞″		
Cross slide travel	3½″		
Flame-hardened and ground cross slide ways	yes		
TAILSTOCK			
Tailstock spindle diameter	2⅛″		
Tailstock spindle travel	4½″		
MISCELLANEOUS			
Size of lathe tool	¾″ x ¾″		
Net weight, base machine	3400 lbs.		
Template type length stops	yes		

You make the comparison *with any 10″ lathe*

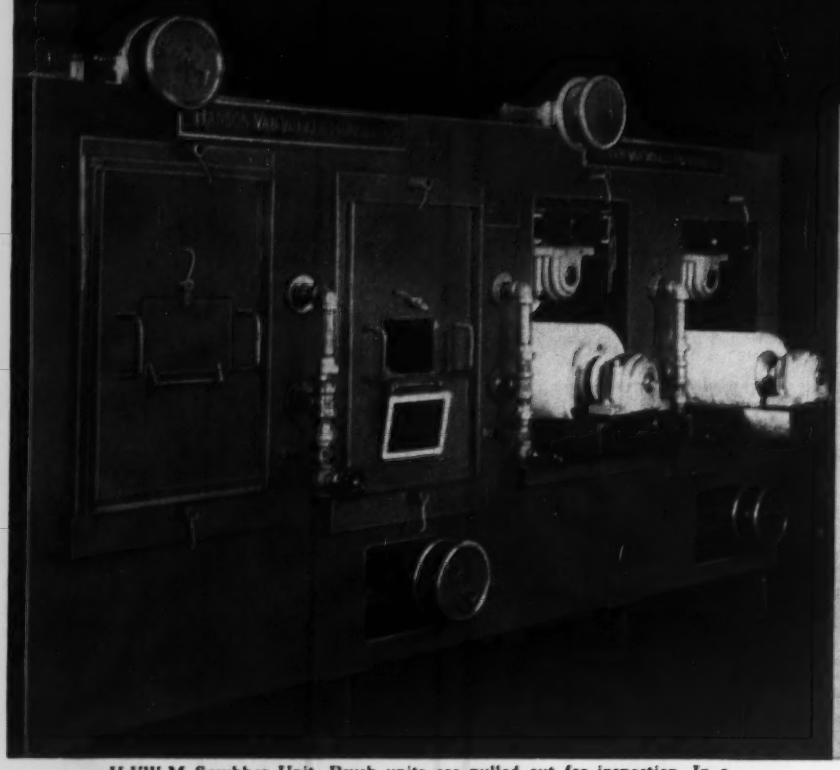
Compare the Lodge & Shipley 10″ HI-TURN Production Lathe with *any other* 10″ lathe . . . even with 13″ lathes. If you don't need additional thread chasing facilities, it's the lathe for you!

Get complete details now. Write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Your Lodge-ical Choice for low-cost high-production

Lodge & Shipley

CONTINUOUS STRIP AND SHEET METAL PROCESSORS



cut cleaning time to a fraction with this automatic H-VW-M SCRUBBER UNIT

H-VW-M Scrubber Unit. Brush units are pulled out for inspection. In a matter of minutes they could be replaced, if necessary with new brushes.

...and no down time either! Brushes are replaced easily while unit is in operation!

H-VW-M Scrubber Units—which adapt to fit into any system—are equipped with an exclusive, patented device that permits replacement of brushes *while the unit is running*. Just turn a few bolts, slide worn brush out, and insert replacement. Not a moment's production time is lost!

Add the advantages of this remarkable new feature to the enormous savings you'll realize in cleaning, reworking and inspection time, and you'll see why the rugged, efficient H-VW-M Scrubber Unit has no equal.

Get more facts about H-VW-M Scrubbers, with their exclusive easy-brush-replacement feature, by writing today for Bulletin HB-100.

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N. J.
Plants: Matawan, N. J. • Grand Rapids, Mich.
SALES OFFICES: Anderson (Ind.) • Baltimore • Beloit (Wisc.) Boston • Bridgeport • Chicago • Cleveland • Dayton • Detroit Grand Rapids • Los Angeles • Louisville • Matawan Milwaukee • New York • Philadelphia • Pittsburgh • Plainfield Rochester • St. Louis • San Francisco • Springfield (Mass.) Utica • Wallingford (Conn.)

H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

Designing a new wire product?

Call American Steel & Wire!

Steel wire comes in so many different grades, shapes and finishes that it isn't easy to keep them all at your fingertips.

For this reason, we suggest that you give your American Steel & Wire representative a chance to help with new designs while they are still on the drawing board. He may be able to suggest 1) a more economical wire, 2) a wire that will fabricate more easily or 3) a slight design change that will simplify production or lower the cost of the raw material.

At AS&W, we *use* a lot of wire in our own plants; and have learned many little tricks that are yours for the asking. Just call your American Steel & Wire representative.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN MANUFACTURERS WIRE

USS

AMERFINE—*high quality fine wire.*
AMERSPRING—*music steel spring wire.*
AMERTEMP—*heavy-duty oil-tempered wire.*
AMERLOY—*alloy heading wire.*
AMERHEAD—*uniform heading wire.*
AMERSTITCH—*extra-tough metal stitching wire.*

UNITED STATES STEEL

Model VU-120 weighs only 35 lbs. Main wheels run on ball bearings; casters swivel on ball bearings, run on oilite bearings, are shrouded as protection against slag.

Torches on Model VU-120 easily angled for bevel cuts. Machine accommodates both 2 or 3-hose torches, and in certain set-ups each holder can handle multiple torches.

Operates at same speeds forward or reverse.
Cuts straight lines, circles, square or bevel kerfs.
Adaptable to many automatic welding applications.

Now constant running motor and 3-position torque-converter transmission of new Model VU-120 bring you speeds from 0 to 180″ per minute—forward and reverse—without loss of power at low speeds. In neutral position, machine free wheels so you can set up easily and quickly. Wide speed range enables you to adapt travel carriage to many automatic welding applications, using either submerged or inert arc.

You get remarkable accuracy from the Model VU-120. Floating rear caster practically eliminates side tilt and wobble. There's no "creeping"—shut off machine and it stops instantly.

Universal torch holder accommodates any model VICTOR machine cutting torch, with or without gear rack. Two torch holders can be used if desired. Case is pre-drilled for extra torch holder, side guide roller, or counterweight.

Try the fast-operating VU-120. Ask your VICTOR dealer for a demonstration on your job NOW . . . or write us for descriptive Bulletin 353.

VICTOR for welding

For maximum efficiency and safety, use genuine Victor tips and parts

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

31

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Quality high speed steels
. . . still the best choice for dependable cutting tools

More Economical!
Tougher!
Less Chipping!
} *than carbide*

On countless applications, cutting tools made of quality high speed steel have given more economical, dependable service than carbide tools. The superior toughness of high speed steel results in more cutting versatility and minimizes tool chipping. High speed steel cutting tools perform well under variable chip load conditions with no need to "baby" the tool. Also, with proper sharpening and honing (comparative to that given carbide tools) phenomenal performance can be obtained from high speed steel.

Latrobe's XL® high speed steels—*first in quality*

Latrobe's XL® high speed steels contain uniformly dispersed alloy sulphides for improved machinability and longer tool life. Also, as a result of Latrobe's exclusive DESEGATIZED® process of manufacture, both the alloy sulphides and the wear resistant carbides are evenly dispersed throughout the steel. This process assures full structural uniformity, higher edge strength and consistent response to heat treatment.

For dependable service . . . use high speed steel cutting tools!

Your nearest Latrobe representative will be pleased to furnish complete data on XL high speed steels.

LATROBE STEEL COMPANY
MAIN OFFICE and PLANT: LATROBE, PA.
BRANCH OFFICES and WAREHOUSES located in Principal Cities

Here's 124 Pages of Valuable Data on STAINLESS STEEL

Stainless and heat resistant steel can usually be classed as a critical material, since it not only contains strategic alloys but is indispensable in many vital industrial and armament applications. It is always important, therefore, to make every pound go as far as possible.

The latest edition of our comprehensive 124-page, case-bound Stainless Steel Handbook is ready for distribution now. It will help you to select the right stainless steel and to use it properly. Comprehensive listings of analysis, properties and characteristics of each type will guide you in specifying grades that will do your job most efficiently. Clear, concise fabrication data will help you speed production and cut waste.

Your copy of the Stainless Steel Handbook will be sent—*without charge*—upon request. Our only stipulation: please make your request upon your company letterhead. ● Write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

ADDRESS DEPT. S-82

For Stainless Steel in ALL Forms—call

Allegheny Ludlum

AL STAINLESS STEEL ®

WSW 9158 B

Warehouse stocks carried by all Ryerson Steel plants

Now you can get from PROGRESSIVE Sems Fasteners with an extra customized touch — Sems Fasteners which are custom-made to your order. This means: (1) specifically made for you — not bin stock parts; (2) fast, custom-handling of every order; *plus* (3) the double economy of low initial cost *and* the savings in your assembly operations possible only with high precision, torsion-tested fasteners.

STANDARDS AND SPECIALS CUSTOMIZED FOR YOUR NEEDS

THE PROGRESSIVE MFG. CO.
Division of The Torrington Company
76 Norwood Street, Torrington, Connecticut

260% Greater Torque...

when your equipment is powered with Chrysler Industrial Engine and Chrysler Torque Converter

Here's a "natural" for any product requiring dependable power *plus* the means of automatically increasing *work ability* throughout the engine's speed range.

It's the Chrysler "power twins"—Chrysler Industrial Engine and Chrysler Industrial Torque Converter. Together, they make a lightweight, compact package offering high torque multiplication—up to 260% greater torque than you may be getting now—plus easy installation and trouble-free operation. Torque Converter features include dual cooling (liquid and direct air), and an optional built-into-housing output shaft governor control.

Chrysler Industrial Torque Converter is assembled with the Chrysler Industrial Engine of the manufacturer's choice. The combination may be ordered Chrysler-equipped for use with direct drive, transmission or power takeoff. Manufacturers may also specify high or low inertia flywheel—whichever best meets their requirements.

Check this power combination—Chrysler Industrial Engine (230 to 331 cubic inch displacement, in-line 6 or V-8), plus Chrysler Industrial Torque Converter. For more details see a Chrysler Industrial Engine Dealer, or write: ***Dept. 510, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***

BUILT FOR EACH OTHER—CHRYSLER INDUSTRIAL ENGINE AND CHRYSLER INDUSTRIAL TORQUE CONVERTER

HORSEPOWER WITH A PEDIGREE

INDUSTRIAL ENGINE DIVISION
CHRYSLER CORPORATION

Chrysler INDUSTRIAL ENGINES

TO MEET AND BEAT HIGH PRODUCTION COSTS

compare the blades you're using with STAR

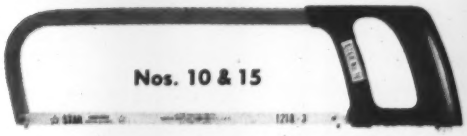
THE STAR BLADES GIVE ALL 5

1. Uniformity in fabrication
2. Proper Hardness
3. Efficient Tooth Design
4. Sufficient Set for Clearance
5. Clearly marked for Ease of Identification

Point 1 OF STAR'S 5 FEATURE CHECKLIST

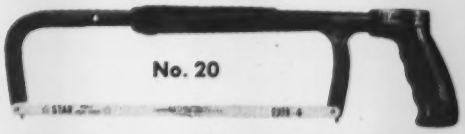
UNIFORMITY IN FABRICATION

All saw blades are made by a step-by-step process. But the finished blade will be perfect *only* if each preceding step is perfect. Star Blades are uniformly perfect because every step in the Star manufacturing process is done on super-accurate *automatic* machines—under the supervision of highly skilled operators.



Nos. 10 & 15

No. 10 – Green molded handle. Almost indestructible. Shaped for comfort. Patented Lever-Lock positions, tensions blades automatically. **No. 15** – Red molded handle, chrome-plate finish. Same features as No. 10.



No. 20

Long a favorite with mechanics, this gunmetal finish adjustable pistol-grip frame with lever for lock blade features extra easy blade change.

STAR BLADES

Manufactured by

CLEMSON BROS., Inc., Middletown, N. Y., U. S. A.

Makers of Hand and Power Hacksaw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Lawn Machines

Clemson Bros., Inc.
Middletown, N.Y., U.S.A.

☐ Please send the STAR Metal Cutting Guide that contains information on blade types, cutting techniques, feeds and speeds and general metal cutting information.

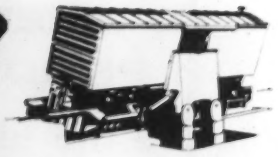
☐ Please send the STAR Metal Cutting Chart—A handy guide for the shop metal worker.

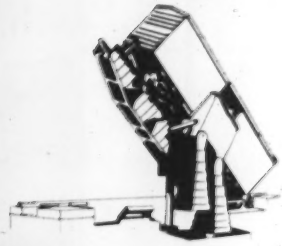
Name_____

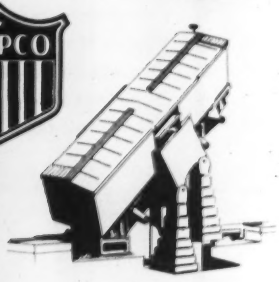
Address_____

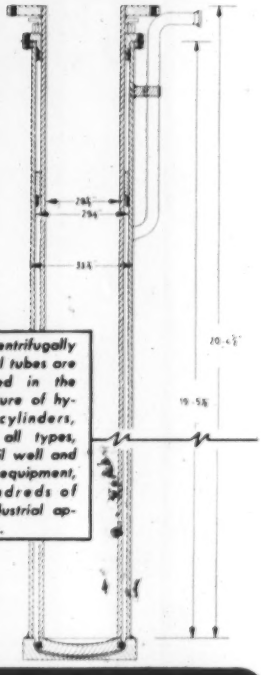
City_____ Zone____ State____ 1540

ACIPCO TUBES SUPPLY "*muscle*" IN NEW GRAIN UNLOADER









This new bulk box car unloader, the "Sequencomatic" by Straight Engineering Company, is an outstanding example of efficient and ingenious design. It literally picks up a loaded car weighing up to 220,000 pounds holding as much as 2200 bushels of grain and pours out its contents, smoothly and completely in as little as *just four minutes.*

The massive "muscle" of this superior grain unloader is a hydraulic cylinder almost twenty feet long. Acipco supplied this cylinder, *completely fabricated.* It is an example of the ability of Acipco's complete facilities to meet rigid specifications promptly and dependably. This cylinder is also an example of the unsurpassed *quality* offered in Acipco centrifugally spun steel tubes.

Investigate the outstanding potentials of Acipco tubes for service in your tubular application. You, too, will find extra quality at extra savings.

Acipco centrifugally spun steel tubes are now used in the manufacture of hydraulic cylinders, rolls of all types, drums, oil well and chemical equipment, and hundreds of other industrial applications.

SIZE RANGE: Lengths up to 16'—longer lengths by welding tubes together. OD's from 2.25" to 50", wall thicknesses from .25" to 4".

ANALYSES: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steels, plain carbon grades and special non-standard analyses.

FURNISHED: As cast, rough machined, or finish machined, including honing.

AMERICAN CAST IRON PIPE CO.

Special Products Division

BIRMINGHAM 2 ALABAMA

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Austin-Hastings Co., Inc.
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an electric arc

PLUS outstanding engineering developments create a new economy in melting today

The electric arc, a quick, clean source of heat supply for electric furnaces, provides higher thermal efficiency than any other supply of heat. The result is cost reduction and higher quality of product. Whiting Hydro-Arc Electric Furnaces employ this important arc, yet outstanding exclusive Whiting advancements assure a still greater melting efficiency. This is accomplished through the use of a new patented control development that provides a constant arc for automatically heating and melting the charge. Add to this such Whiting features as an automatic electric clamp, simplicity of top charge and air-counter-balanced hydraulic electrode positioning equipment . . . all contributing to greater savings.

Talk over electric furnaces now with a Whiting Hydro-Arc engineer. Find out how, through scientific control and application, Whiting Hydro-Arc Electric Furnaces assure lowest cost per ton of melt.

Whiting Corporation, 15643 Lathrop Avenue, Harvey, Ill.

Manufacturers of Cranes • Trambeam • Trackmobile • Foundry, Railroad and Chemical Equipment

WHITING

Hydro-Arc

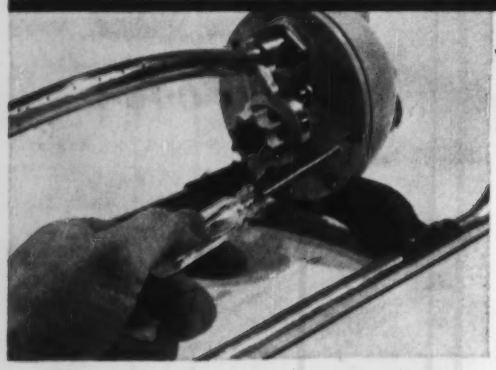
Write for informative bulletins!

Many hints and suggestions for economical electric arc furnace operation are contained in "Facts on Duplexing" (FO-4), "The Electric Furnace in The Iron Foundry" (FO-6), "The Whiting Hydro-Arc Furnace Control" (FO-10). Send for the copy or copies you need right now! Specify by "FO" number.

Investigate the assembly savings made possible by P-K® self-tapping screws

Because P-K Type A Self-tapping Screws have clean, deep slots and sharp gimlet points . . . and because they are consistently uniform, Reznor Mfg. Co. enjoys important savings in the assembly of their gas heaters.

To hold the plastic handle halves of their Instant Heat Soldering Irons together, The Lenk Mfg. Co. specifies P-K Type F Self-tapping Screws. No need for a separate tapping operation. Production is increased and costs reduced—thanks to P-K Screws.



Melnor Industries, Inc. (formerly Melnor Metal Products Co.) puts assembly strength into their famous "Swingin' Spray" oscillating lawn sprinkler by fastening zinc and aluminum parts with P-K Self-tapping Screws—7 Phillips Head Type Z and 18 Type F. They start right . . . drive right . . . and stay tight.

PARKER-KALON DIVISION, General American Transportation Corporation
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

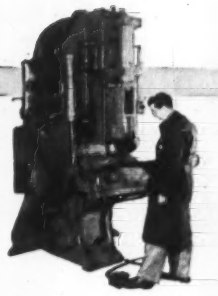
PARKER-KALON® fasteners

Sold Everywhere Through Leading Industrial Distributors
Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

4 COST-CUTTING SOLUTIONS

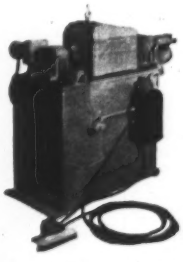
FOR FABRICATORS OF TUBING, PIPE, MOLDINGS AND EXTRUDED SHAPES

PINES SIZE 4 BENDER — Now cold forms ultra-thin 4" x .020" stainless steel tubes for aircraft to 8" c/l radius. Ability to form these sharp, small radius bends without wrinkles saved $14,000 per plane for an aircraft manufacturer.



PINES 20-TON BENDING PRESS — Speeds production of automotive tail pipes, completes some jobs 50% faster by eliminating work handling. Up to 10 bends produced in a single progressive operation, most jobs completed in one handling.

PINES SEMI-AUTOMATIC BENDER — Capacity up to 300 bends per hour, for applications where output does not require speed of fully automatic machines. Hydraulic power assures accurate, highly uniform results. Economically tooled, easy for women to operate, requires up to 60% less floor space.



PINES END-FINISHING MACHINE — 3" capacity, floor-mounted unit with air clamping. Speeds deburring, facing, pointing, or light hollow mill turning. Available with manual or air spindle advance. Other units also provided for smaller and larger work.

● Since 1941, when Pines Automatic Hydraulic Bending Machines were first introduced, more and more plants fabricating tubing, pipe, rods, moldings, rolled and extruded shapes, have found it profitable to standardize on Pines Machines. Dependable accuracy, combined with fast, more efficient operation are two of the major reasons why hundreds of commercial and industrial plants have turned to Pines to find cost-cutting solutions to bending and end-finishing problems. A study of the four examples shown here may suggest how you may profitably take advantage of the latest developments in fabricating the "Pines-way".

WRITE FOR *Free* DATA SHEETS

For additional cost-cutting ideas, write today for free copies of "Pines News"—illustrates latest bending and end-finishing techniques applied to actual jobs. And call on Pines engineers for assistance on any job.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery · 662 WALNUT · AURORA, ILLINOIS

PRODUCTION BENDING · DEBURRING · CHAMFERING MACHINERY

Announcement!

...Cleveland

now offers a complete line of

Top Quality

Socket Screws

Our line of socket screws has been expanded to include all standard socket items, in all catalog sizes, made to Cleveland's extra high standards of quality.

- Socket Head Cap Screws
- Socket Set Screws
- Flat Head Socket Cap Screws
- Button Head Socket Cap Screws
- Shoulder Screws
- N.P.T.F. Pressure Plugs
- Socket Screw Keys
- Precision Dowel Pins

Complete stocks of Cleveland Socket Screw Products are available for immediate shipment. Write for new Socket Line Folder.

Among the facilities already in use at the modern new Cleveland plant is this spacious metallurgical and chemical laboratory.

The Cleveland Cap Screw Company

2935 East 79th Street • Cleveland 4, Ohio • VUlcan 3-3700 TWX CV-42

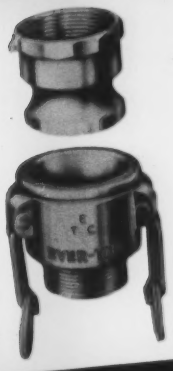
Warehouses:

Chicago • Philadelphia • New York • Providence • Los Angeles

main valve seat for fire plug

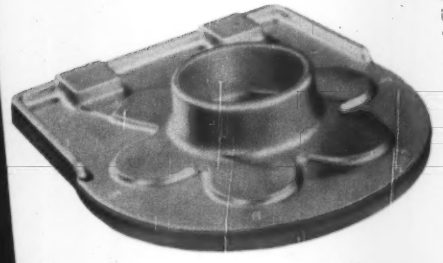
Sand-cast pegs bent easily, causing improper fire plug operation. Full line pressure could not be maintained. Machining often uncovered blow-holes causing rejects. Switched to brass forging for higher strength, dense structure, closer tolerances, reduced over-all costs.

quick-acting fuel coupling



To enhance its reputation for quality and to assure tightness under pressure, Ever-Tite Coupling Company turned to forgings for quick couplings used to transfer petroleum and other liquids. Because of the abuse to which this type of equipment is subjected, forgings offer unexcelled performance.

base for TV signal transmission



Porosity and blow-holes in sand-cast part caused "high standing wave," or loss of power feeding into TV transmitting tower through base on end of cable. This required tearing down whole assembly at considerable cost. Switch to dense, strong forging eliminated rejects and power leakage.

water meter lid and register box

Lid converted from sand casting to brass forging. Register box from sand casting to pressure die casting. Weight reduced greatly on both — thus lowering costs. Closer tolerances after change eliminated costly machining on the box.

Vital Change

from sand castings to brass forgings

Titan

METAL MANUFACTURING COMPANY

Bellefonte, Pa. Offices and Agencies in Principal Cities

Titan brass forgings are more easily drilled, tapped, broached and milled than are sand castings. Fewer machining rejects result. Forgings are hot-pressed quickly, are denser, tougher and stronger. Moreover, brass forgings have a smooth beauty and warmth not obtainable in sand castings. Scrap is reduced. Some machining operations necessary on sand castings are actually eliminated by switching to accurate-dimensioned forgings. Getting down to brass tacks, what this means to you is lower costs and a better product by switching to Titan hot-pressed brass forgings.

Send us a sample, drawing, and production quantities of sand-cast assembly parts you now use. We'll quote you on changing to brass forgings.

If you want more data on Titan brass forgings, send coupon below:

Dept. C.
Titan Metal Manufacturing Co., Bellefonte, Pa.
Gentlemen:

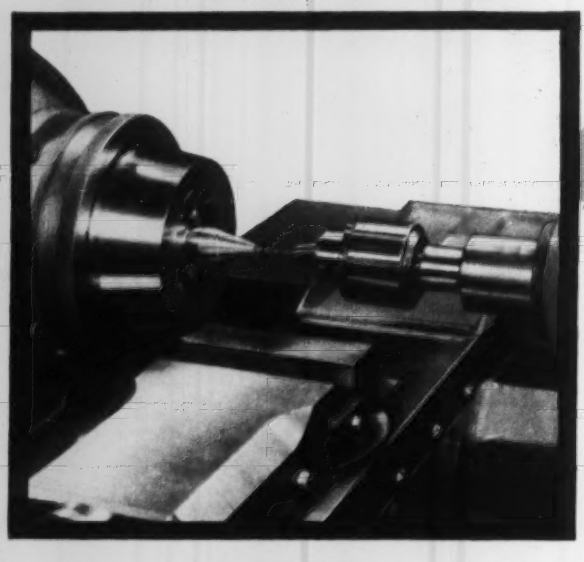
- ☐ Will send sand-cast part and details for you to quote as brass forging
- ☐ Please send further data on Titan brass forgings.
- ☐ Have Titan representative call

Name _____ Title _____

Company _____

Address _____ City & State _____

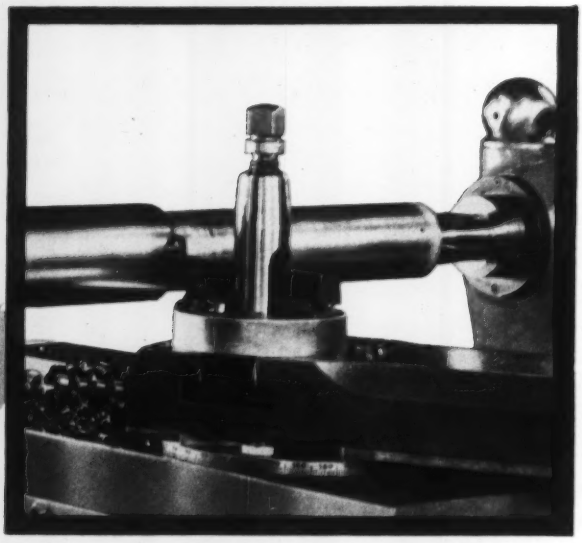
Rivett's 2 for 1 Lathe!



Sensitive...

As An Instrument Lathe

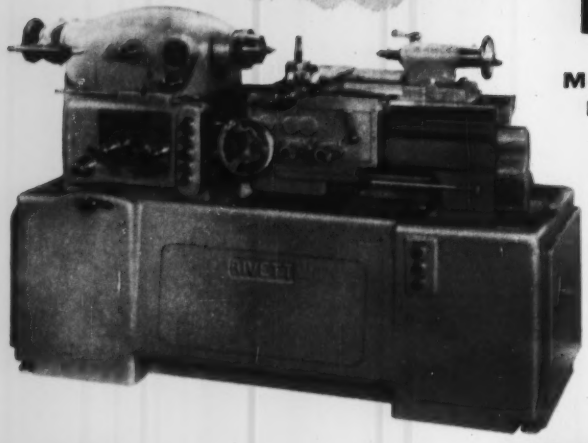
Responds to the lightest touch of the operator. Turns within .0004" in 12" length!



POWERFUL...

As An Engine Lathe

Full horsepower transmitted to spindle. Takes ¼" chip with .020" feed on cold rolled steel.



Model 1020S "Steelway"
PRECISION TOOLROOM LATHE

This lathe has the industry talking! Because of extreme precision, it has long been recognized as the top tool by master mechanics. Now, its adaptability and broad usefulness have highlighted its productivity. As one satisfied user states, "Our toolmakers go to a Rivett first in preference to our other lathes!"

RIVETT LATHE & GRINDER, INC.
Dept. ST-10, Brighton 35, Boston, Mass.

Go to Rivett now for information about this big, beautiful machine.
Send for bulletin 1020B.

RIVETT
"Steelway" Lathes

Which package is best for you?

ROEBLING HIGH CARBON WIRE is packaged in many ways... and for every kind of usage there's one particular type of packaging that will bring top handling and production efficiency... new economy in your plant. For certain wires, Roebling's new large-size reels or new disposable spoolless cores have special money-saving advantages:

The large reels are ideal for long runs. They reduce down time to a minimum.

The new spoolless core (a hollow fibre core without flanges) abolishes the storing and return of empty spools ... eliminates charges for spools and waiting for credits.

You *pay* for the best when you buy high carbon wire. Make sure you *get* it in wire and packaging. Specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING CF&I

Subsidiary of The Colorado Fuel and Iron Corporation

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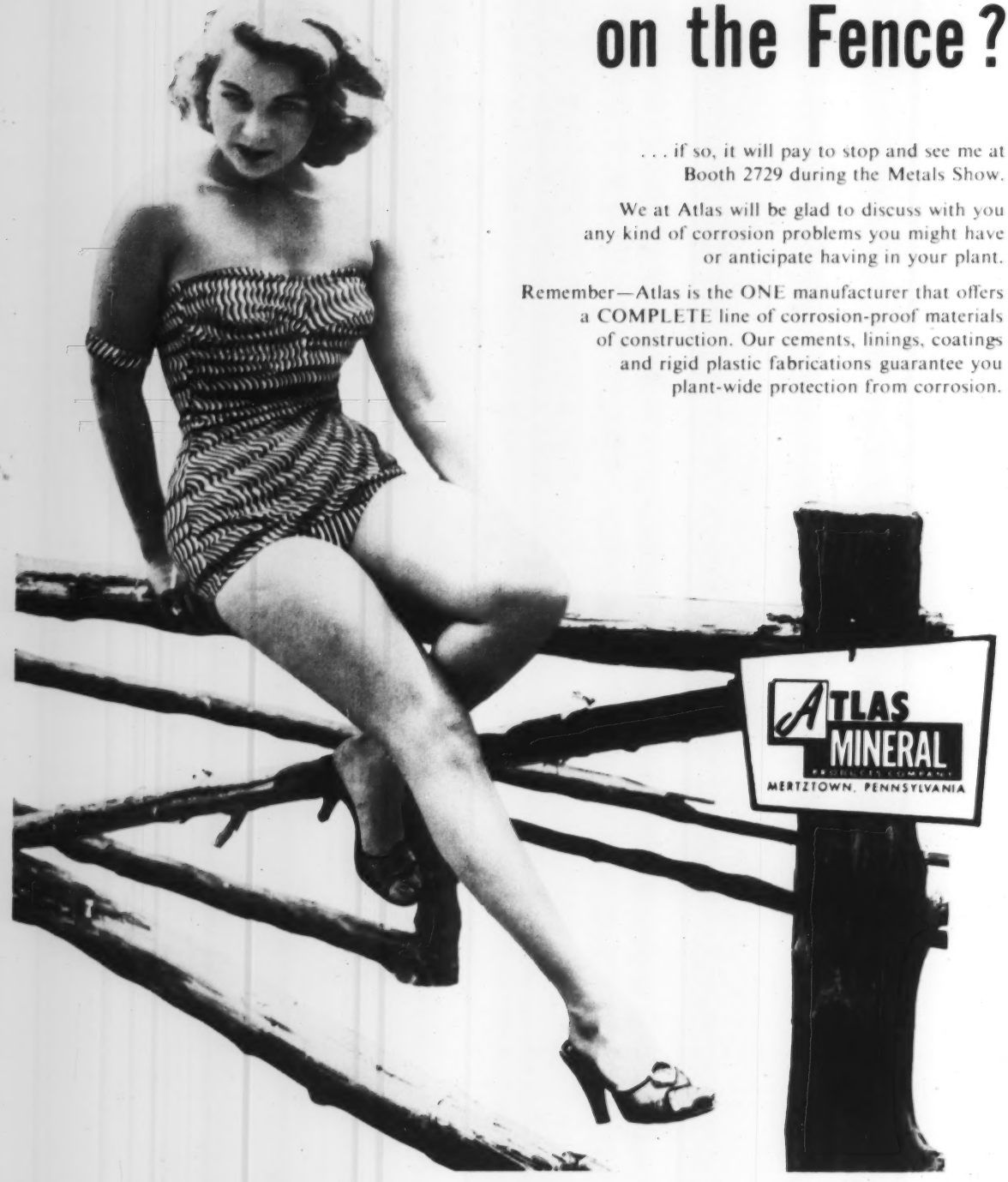
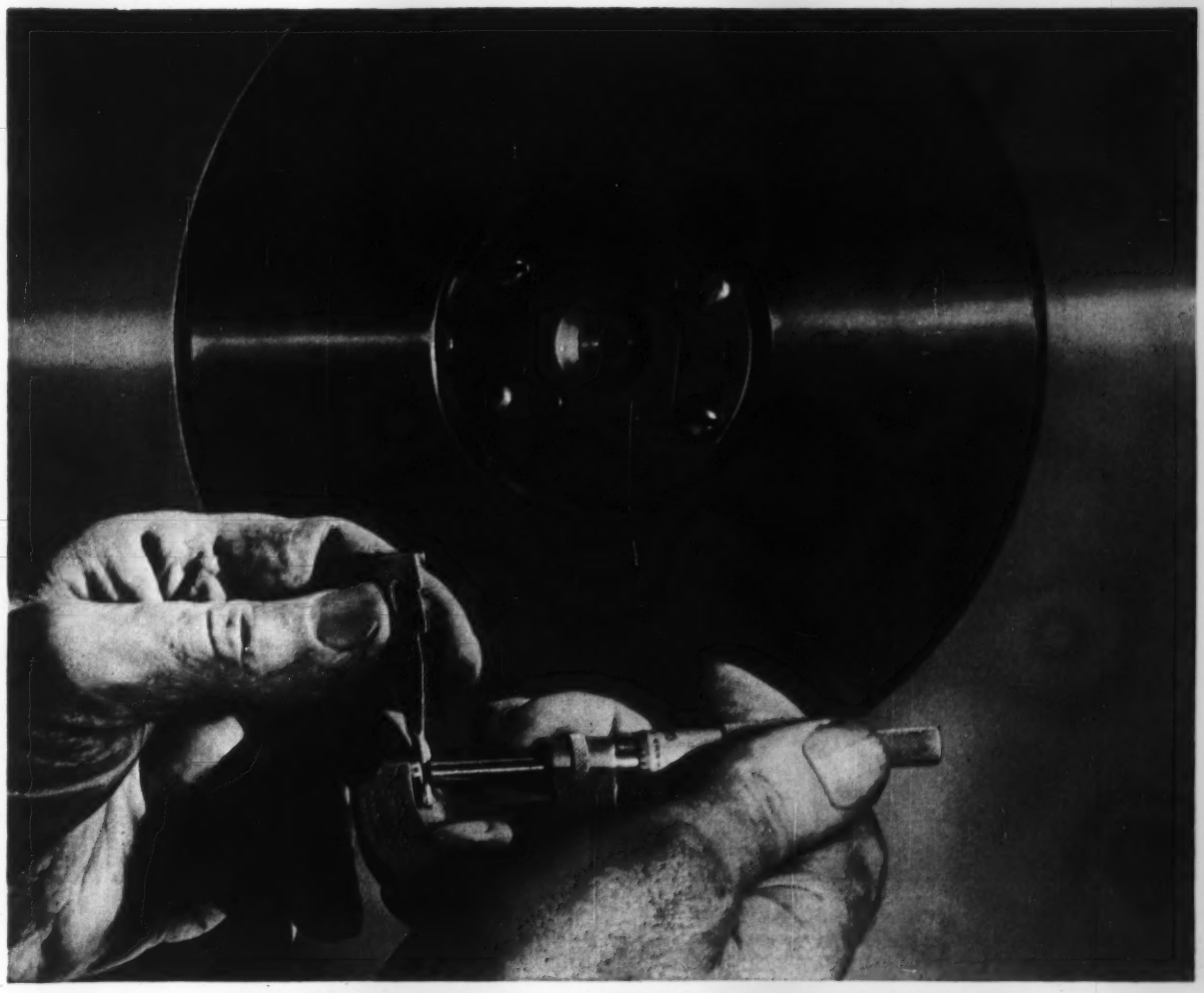
DO CORROSION PROBLEMS have you on the Fence?

. . . if so, it will pay to stop and see me at Booth 2729 during the Metals Show.

We at Atlas will be glad to discuss with you any kind of corrosion problems you might have or anticipate having in your plant.

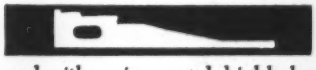
Remember—Atlas is the ONE manufacturer that offers a COMPLETE line of corrosion-proof materials of construction. Our cements, linings, coatings and rigid plastic fabrications guarantee you plant-wide protection from corrosion.





ROTARY SWAGING

produces precision work



Tolerances of ± .001" and better can be produced by Torrington Rotary Swaging Machines—and with an improved, highly burnished finish!

This firing pin was swaged to a tolerance of ± .001", compared to a tolerance of ± .003" when the part was turned. The switch to swaging eliminated ironing marks which had caused hardened pieces to break. No breakage was encountered after swaging.

Precision work can be performed rapidly with swaging in many different operations including reducing, tapering, pointing, sizing, bonding, forming inside contours or threads.

Send for our informative booklet on Torrington Swaging Machines, or ask to have a technical representative call to show you how you can benefit from rotary swaging.

THE TORRINGTON COMPANY
Swaging Machine Division
150 North Street, Torrington, Conn.

Advantages of Rotary Swaging—

1 Savings in material—swaging is chipless—shapes the work instead of cutting metal away.

2 Savings in labor—swaging can be done by unskilled labor.

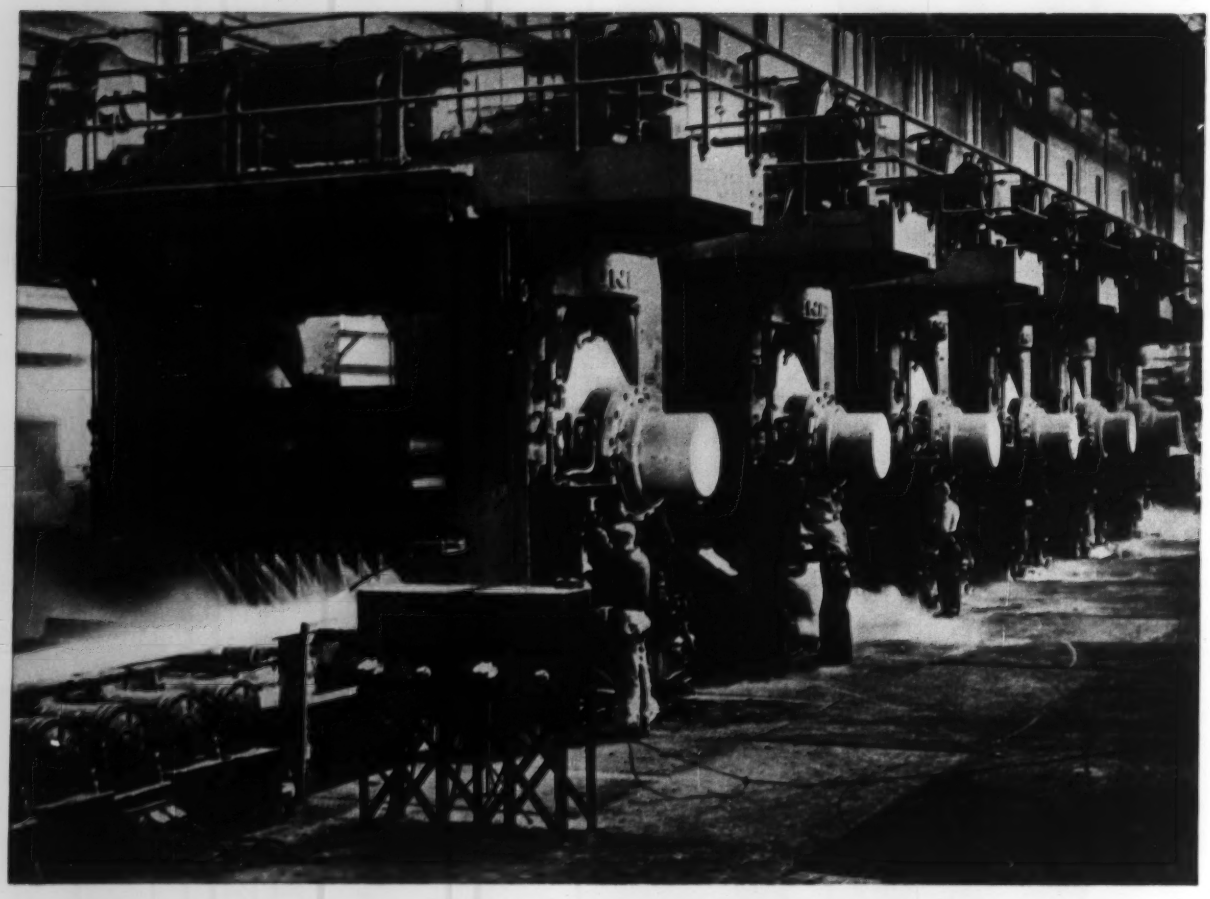
3 Improved products—swaging improves grain structure, tensile strength, resiliency and finish. Produces work accurate to ± .001" and better.

Write for new catalog—It describes swaging benefits, covers selection of a swager, and gives specifications of Torrington's new streamlined Rotary Swaging Machines. Ask, too, to see our new motion picture on swaging.

90th ANNIVERSARY 1866–1956

TORRINGTON ROTARY SWAGING MACHINES

Makers of Torrington Needle Bearings



Why Texaco Regal Oil protects oil film bearings so much better

Texaco Regal Oil is a specially refined heavy oil—widely used for roll stand circulating systems. It has exceptional oxidation resistance, separates readily from water. That means no sludge. Lines stay clear to carry cooling lubricant unfailingly to your roll necks.

With *Texaco Regal Oil*, bearings get full protection, run at normal temperatures, last longer. Your maintenance costs are bound to be less.

For enclosed reduction gear drives, use *Texaco Meropa Lubricant*. It retains its high EP characteristics through long, severe service. It resists oxidation, thickening and foaming—assures smoother operation and longer gear life.

Let a Texaco Lubrication Engineer show you the way to greater efficiency and lower costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

VISIT TEXACO BOOTH 1602, AMERICAN SOCIETY FOR METALS SHOW, CLEVELAND, OCTOBER 8-12.

TEXACO

TEXACO Regal Oils

(HEAVY CIRCULATING OILS)

STEEL

October 1, 1956

Metalworking Outlook

Memo on Labor Negotiating

"Since the end of the steel strike, contract negotiation with unions has been the roughest and most demanding in my experience." So says an industrial relations expert who supervises or gives counsel for parleys on some 200 contracts yearly, mostly small and medium companies in metalworking. Why the difficulties? This is "catch-up" time for unions. They are giving greater attention to smaller firms, now that few major openings loom in metalworking until 1958. The steel settlement provides a big target to shoot at. Labor men, possibly helped by the AFL-CIO merger, have more statistical data to support their arguments and improved legal and other assistance from their internationals.

Dilemma in Skilled Labor

We're short about 150,000 skilled craftsmen a year. The U.S. has about 9 million skilled workers, but loses 250,000 a year because of death, retirement or other reasons. Some 100,000 come from apprenticeship programs, skilled immigrants and other sources. So, we're short about 150,000, who must be upgraded from semiskilled jobs. That's the reason for the growing importance of upgrading programs. What's the status of yours?

Impact of Inflation, Taxes

A married couple with two children who made $3000 in 1939, would have to earn $6122 a year now to have the equivalent buying power, so great has been inflation and the rise in taxes. The $5000-a-year family in 1939 paid Uncle Sam $59 in taxes and kept $4941. It now takes $10,583 to match this, according to the National Industrial Conference Board. Of that income, the government collects $1511, while inflation's toll is $4131. Similarly, a couple earning $10,000 before the war haven't held their own if their income has failed to reach $22,428.

Copper Goals Closed

The Office of Defense Mobilization has closed down mobilization expansion goals for copper. That's the target under which the government granted fast tax amortization to firms increasing copper supplies. The goal of 2,270,000 tons of copper set in 1952 was reached several months ago.

Small Firms' Defense Share Slips

Small business' share of military contracts continued downward in fiscal 1956. The Senate's Committee on Small Business reports that small firms received only 19.6 per cent of the $17.8 billion awarded in contracts by the Defense department in fiscal 1956, compared with 21.5 per cent the year before and 25.3 per cent in fiscal 1954. One partly offsetting factor: The small business share of Atomic Energy Commission prime contracts is ris-

ing. Between the third and fourth quarters of fiscal 1956, its share of the dollar value rose from 2.9 to 4 per cent.

A First in Atomic Energy

Babcock & Wilcox Co. has become the first firm in the U.S. to obtain general licenses from the Atomic Energy Commission to receive and use special nuclear and nuclear source materials. Significance: If more companies can get similar licenses, the easing in AEC policy will help markedly in spurring the application of atomic energy for peaceful uses. Before its general licenses were received, B&W had to obtain individual permits for each use of source and special nuclear materials.

Atomic Spending

About one-fourth ($300 million) of total expenditures for all nuclear research and development activities outside the weapons area between 1955 and 1958 will be made by private industry. That was revealed at the Atomic Industrial Forum held in Chicago last week. By 1964, cumulative spending by industry and government for nuclear research and development may hit $7.5 billion.

Rheem Aims at 1958

Rheem Mfg. Co. has set 1958 as the target date for introduction of a new all-gas central home heating and air conditioning unit. It has just unveiled a prototype in Chicago. The cost, Rheem promises, will be competitive with electric-gas combination units.

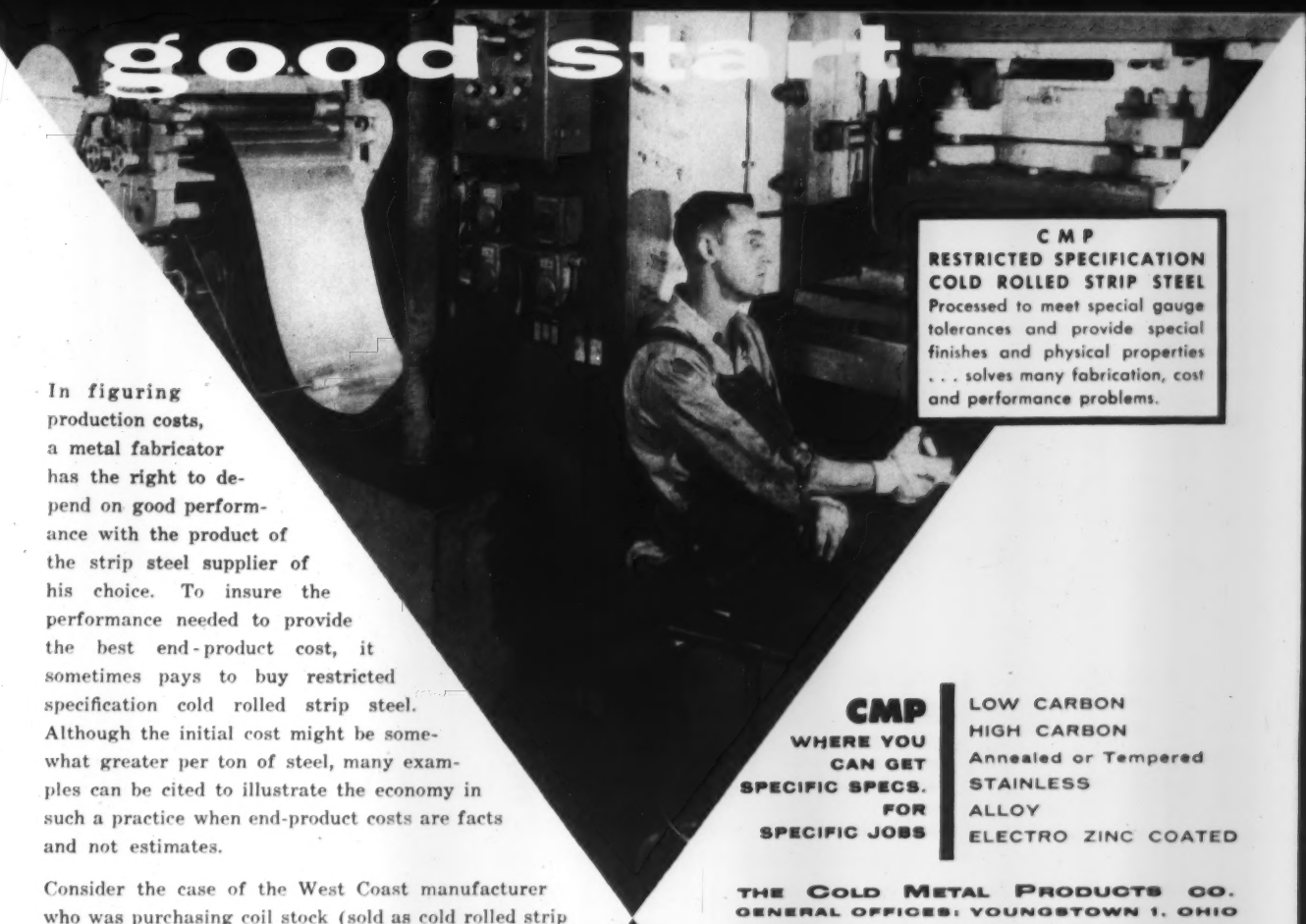
More Prices Rise

A sample of the latest price increases: Gradall Division of Warner & Swasey Co. has boosted quotations an average 7.5 per cent on construction machinery. General Electric Co. has raised prices of steam turbine generators 10 per cent, all hermetically sealed motors to 7 in. in diameter (rated from ½-hp) at least 8 per cent. An 8 per cent average hike in carbon and graphite electrodes and anodes was announced by Union Carbide & Carbon Corp.'s National Carbon Co.

Straws in the Wind

Kaiser Aluminum & Chemical Corp. paid $2.9 million to the General Services Administration for the Erie, Pa., forging plant it has been operating since 1954 . . . Outboard motor makers expect to sell 600,000 units this year for $226 million . . . At least another $1 billion must be invested in the bituminous coal industry to provide the expanded capacity which the nation will need by 1965, says Harry LaViers, president of South-East Coal Co., Paintsville, Ky. . . . The Cleveland Browns' use of ultrahigh frequency radio to direct the quarterback has piqued the interest of industry. Being talked about are comparable uses for hard-to-reach construction men on high girders and for in-plant communication. The receiver would be worn in an ordinary hat . . . Ford Motor Co. and Reynolds Metals Co. have begun construction of adjacent plants at Muscle Shoals, Ala., so that molten metal from the Reynolds facility can be shipped direct to the Ford building for use in the manufacture of engine parts and other components.

good start



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In figuring production costs, a metal fabricator has the right to depend on good performance with the product of the strip steel supplier of his choice. To insure the performance needed to provide the best end-product cost, it sometimes pays to buy restricted specification cold rolled strip steel. Although the initial cost might be somewhat greater per ton of steel, many examples can be cited to illustrate the economy in such a practice when end-product costs are facts and not estimates.

Consider the case of the West Coast manufacturer who was purchasing coil stock (sold as cold rolled strip steel) for a forming operation where close gauge tolerance was not of greatest importance. (However, the drawing quality, because of chemistry, was not uniform and die costs and rejects were causing expensive down time and yield losses.) Switching to a **CMP** restricted specification strip, the manufacturer obtained a uniformity in coil after coil that eliminated these problems and provided an end product cost much below his former cost even though his initial steel costs were higher.

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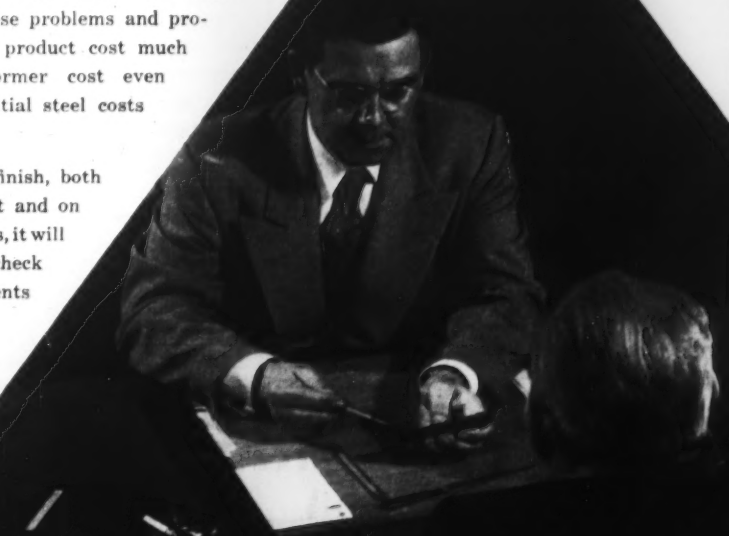
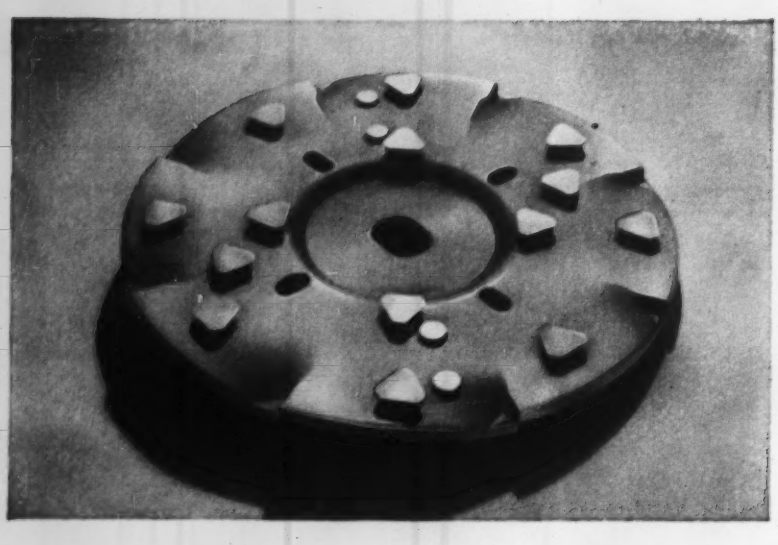
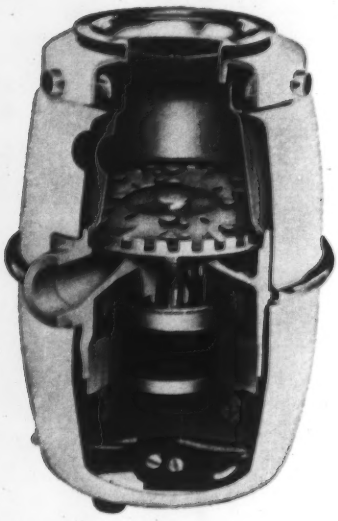


CMP STRIP PROVIDES
Increased production, reduced slow-downs, lower die costs, meets feed and speed requirements of automatic equipment and yields more finished parts per hundred pounds.

better finish





How Armco 17-7 PH Stainless

Makes this part Last Longer, Work Better

Formerly made of chrome-plated carbon steel, this cutter disc for a food waste disposer was reducing the efficiency of the unit. The combination of corrosion and abrasion in grinding food wastes dulled the carbon steel cutting edges.

17-7 PH Solves Problems

Now the cutter discs are made of Armco 17-7 PH Stainless Steel . . . and the troubles are gone. The combination of high hardness and good corrosion resistance obtained with 17-7 PH makes the part much more durable and the cutter has a 15 to 20% faster cutting action.

Fabrication is simplified, too. The cutting blades, 17-7 PH cold-headed rivets, are attached to the formed 17-7 PH disc. Then the assembly is hardened. A simple heat treatment at 1400 and 950 F hardens the entire part to Rockwell C 40.

Unusual Properties

This cutter disc is typical of the improved performance and production you can obtain by utilizing the unusual combination of properties you get in Armco 17-7 PH. Extra high strength and hardness, good corrosion resistance and excellent fabricating characteristics give you many new opportunities to improve your product and reduce manufacturing costs as well.

Two Grades Available at Armco

Armco 17-7 PH is supplied in sheet, strip, plates, bars and wire. A companion grade, 17-4 PH—hardened at only 850 to 900 F, is produced in bars, wire and billets. For complete data on these special Armco Stainless Steels, just fill out and mail the coupon.

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Fabulous Metalworking!

The National Metal Congress & Exposition in Cleveland next week comes as a dramatic reminder of the accelerated progress taking place in the fabulous metalworking industry.

For many years, the industry was pretty much satisfied with the standard metals and alloys abundantly available for all the products it made. Most thinking was in terms of the garden varieties of carbon and alloy steels and various combinations of copper, zinc, tin, lead and aluminum.

Now the old is being swept aside for the new. The hundreds of new and improved alloys listed in the Metal Selector for Special Alloys in this issue of STEEL (following page 162) are ample evidence of the revolution in the making.

Examples:

Over a hundred leaded steels are available from a dozen sources in grades ranging from carbon steels to tool steels. They have their usual properties and an added attraction: They cut like butter.

About sixty vacuum-melted alloys are being produced by eight companies. These materials may be precisely controlled without picking up such tramp elements as oxygen and hydrogen. The 52100 bearing steel, for instance, has twice the endurance limits of the standard electric furnace grade.

A dozen superstrength steels are being made by several companies. Some will handle superloads of 280,000 psi. Don't be too surprised if the figure goes to 400,000 psi in a few years.

The aluminum and silicon bronzes are taking their place among the cupronickels, phosphor bronzes and other standard alloys where properties such as high strength and exceptional corrosion resistance are needed.

Along with these examples of what are becoming standard production materials is a galaxy of metals and alloys for special purposes. The metallurgist can deal with 74 known metals, plus nine related elements such as boron. There are 3403 possible combinations of two elements, 92,000 combinations of three and 4 billion of seven.

We are in an era in which we are only beginning to witness the beginnings of a fantastic future in metallurgy. Yesterday's fancy is becoming today's fact.

Irwin H. Such

EDITOR-IN-CHIEF

(Advertisement)

What's New

IN STEEL FROM STOCK

In the news today are many developments of interest to those who specify, buy or work with steel. Ways in which you can raise efficiency and lower costs in your operations may be suggested by the following summary.

NEW IN RYERSON STOCK—Cold finished Ledloy hexagons in sizes up to 3". (Previous maximum size: 1½".)...Welded, square, structural tubing with a lighter wall. Advantages: Costs less yet has all the strength, good surface, etc., needed for ornamental applications.

NEW TYPE 202 STAINLESS NOW AVAILABLE FROM RYERSON—Pioneering with a new type of stainless steel, Ryerson now offers Type 202 sheets, No. 2B and No. 4 finishes in popular gauges and sizes, for quick shipment from stock. Since nickel may continue in short supply for some time, interest in this new stainless has been strong. Reasons: Type 202 contains only half as much nickel as Type 302 yet compares favorably with 302 in corrosion resistance, fabricates as readily as 302 and costs 2¢ per lb. less.

WHAT ABOUT HOT ROLLED BARS? A leading metal-working publication recently listed hot rolled carbon steel bars as a hard-to-get product—but this is not the case when you draw on Ryerson stocks. Our inventories of hot rolled bars have seldom been better, both as to tonnage and size range.

NEW, ACCURATE I.D. ON CYLINDER TUBING FROM STOCK—In hydraulic cylinder applications, the I.D. is the critical tubing dimension. Yet, until now, buyers of tubing from warehouse stocks could specify only O.D. and wall—and wall thickness may vary as much as plus or minus 10% under standard manufacturing tolerances. As a result, I.D. dimensions could vary so widely that tubing was not suitable for cylinder use. But now buyers may specify both O.D. and I.D. when ordering cold drawn seamless tubing from Ryerson (in 2" through 9" O.D. sizes)—thus assuring the accurate I.D. dimensions needed for cylinders. We believe we are the only warehouse to carry this stock.

REPORT ON NEW E-Z-CUT PERFORMANCE—New proof of the quality of Ryerson's leaded plate steel, New E-Z-Cut, was reported by company which recently made a mold for a miniature tire. Some of the tiny lands forming the tread design were only .015" thick but $30 worth of New E-Z-Cut took the risk out of the $4000 machining job. Because New E-Z-Cut is remarkably clean and free of excessive stringers, even the finest lands of the mold were sharp and true. Because New E-Z-Cut machines up to 30% faster than mild steel, the difficult job was completed in record time. High finish made the mold easy to prepare for plating.

FLUID LINE TUBING WITH IMPROVED FINISH—Another new Ryerson product is Hydra-Luster hydraulic fluid line tubing which has an unusually beautiful finish, free from scale and surface defects because of a new method of atmospherically controlled annealing. This tubing is on hand in all sizes through ¾" O.D. x 16 gauge wall.

PVC PLASTIC PIPE IN LARGE DIAMETERS—8" and 10" pipe in both schedule 40 and 80 have been added to growing Ryerson stocks of the remarkably anti-corrosive plastic—Ryertex-Omicron polyvinyl chloride. Also available: smaller size of pipe, fittings, sheets and rods. For complete data on properties, resistance to more than 300 chemicals, etc., write for technical booklet 80-3.

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Steelmen Speak on Taxes, Expansion

E. G. Grace, chairman, Bethlehem Steel Corp.:
"We must have an enlightened public policy to assist us by means of sound government tax policies which will encourage expansion and development."

C. M. White, chairman, Republic Steel Corp.:
"The government's attitude toward business must remain constructive and impartial. The benefits of such a policy have certainly been proved during the last three years."

R. M. Blough, chairman, U. S. Steel Corp.:
"Adequate earnings resulting from continuing improvement in operations and adequate competitive prices, together with sufficient tax allowance for depreciation, are necessary."

C. B. Randall, chairman, Inland Steel Co.:
"The financing of new construction in the steel industry has been made more difficult as a result of the inflation that has taken place in recent years. Because of this factor and the substantial amounts required for both expansion and the replacement of existing facilities, we believe that a new concept which will provide more liberal depreciation and amortization allowances is needed."

Uncle Sam To Help Steel?

Metalworking executives at last week's AISE show were asking: "Will U. S. reopen steel expansion goals?" Consensus: Some product classes will get help

EXPANSION was in the air at the 1956 Iron & Steel Exposition last week in Cleveland.

Said Ernest T. Weir, chairman, National Steel Corp., Pittsburgh: "Today, our ingot capacity should be about 6 million tons higher to prevent shortages. Over the next five years, we should build another 12.5 million tons."

Questions—Many of the top steel executives attending the show were asking: "How will we finance this growth?" Fast tax amortization was being held out as a possible answer, highlighted by the news that the President's cabinet is to consider the reopening of steel expansion goals "in the near future."

It's estimated that steelmakers have filed requests for $1.3 billion worth of expansion with the Office of Defense Mobilization. Fast tax amortization would permit them to depreciate these facilities in five years, not the 20 or so normally allowed.

Effects: Tax payments are reduced during the early part of a facility's life.

Twist — This system was designed to permit fast capacity expansion needed in wartime. Reopening of the goals now will probably depend on a cabinet decision that there are capacity shortages in steel products needed for defense mobilization.

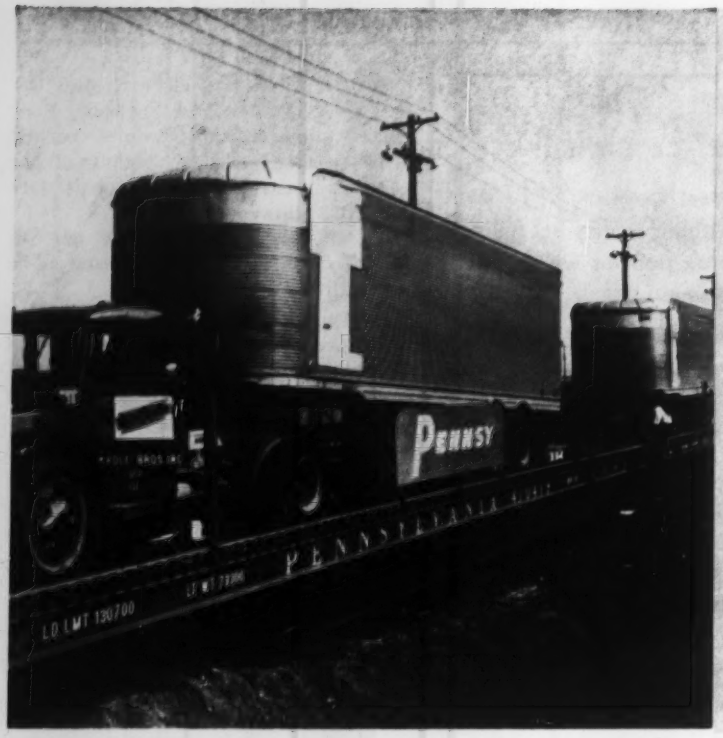
Steelmen say this is already true of some product classes. Plates, structurals and some tubing items are most frequently mentioned. Washington isn't so sure. The Suez crisis may cause it to switch over to the affirmative. If we're forced to move oil around the southern tip of Africa, there will be a pinch on tanker and pipeline capacity. Tightness in plate, structurals and pipe would be confirmed.

Pros and Cons—STEEL surveyed some 100 executives at the show for their opinions on the chances for an early reopening of expansion goals. Most steel company men think that some sort of a program favorable to the industry is in the cards.

Quotes: "It's doubtful, though, that goals will be opened for all product classes" . . . "It's the only way the country can get the steel it needs" . . . "I doubt there'll be any action until after the election: the thing could be too easily made into a political football."

This comment came from the General Electric booth: "Market analysis shows that more mechanization is vital if we are to meet production goals with tomorrow's tight labor force. My company rises and falls with the steel industry."

The Association of Iron & Steel Engineers, sponsor of the exposition, elected James D. O'Roark president for 1957. He's assistant manager, department of service and maintenance, electric, for Weirton Steel Co., Weirton, W. Va.



Pennsylvania Railroad's Piggybacking Climbs

(Number of truck trailer loadings)

Date	Railroad's Own Truck Line	Common Carrier
June, 1956	1666	2271
May	1556	2430
Apr.	1324	2218
Mar.	1519	3080
Feb.	1714	2463
Jan.	1579	2124
Dec., 1955	1468	2789
Nov.	1229	2910
Oct.	1305	3440
Sept.	1278	2261
Aug.	1400	1578
July	1408	995
June	1161	1024
May	1186	744
Apr.	908	841
Mar.	989	651
Feb.	818	0
Jan.	522	0

Piggybacking Takes Hold

Railroads are setting up their own truck lines and experimenting with new equipment and techniques. Result: Piggybacking is making marked progress

PIGGYBACKING, though still an infant, is rapidly gaining stature.

A change in the attitude of railroaders is the chief reason. They're still slow to give out an official statement which proclaims a bright future for piggybacking, but the trend lines are apparent.

1. More and more railroads are setting up piggybacking operations with their own truck lines. These roads will carry twice the number of trailers in 1956 that they did last year.

2. Railroads have been unyielding in their stand against hauling common carrier trucks "because anything that helps the trucks hurts us." Now you can find railroad officials who'll admit privately that such co-operation is "definitely in the cards."

3. New equipment and techniques continue to be explored to make piggybacking more versatile.

Savings—For you, the customer, it'll mean better service — faster shipments, less handling, less damage. Ceco Steel Products Corp., for example, loads trailers with architectural products at Chicago for contractors in Denver. The trailer goes to Denver aboard a Chicago, Burlington & Quincy Railroad flatcar, is unloaded and hooked to a tractor for delivery to the contractor's building site.

The Burlington and its wholly owned Burlington Truck Lines Inc. carried 4844 trailers via piggyback last year. In the first seven months of this year, volume topped 5200, and the outlook for the year is that the volume will more than double the 1955 figure.

A few other examples: The Santa Fe, which began operations in mid-1954, experienced a 10-per-cent-per-month increase in piggyback volume in the first six months of this year. The Baltimore & Ohio Railroad doesn't own a truck line, but leases trucks. Its volume in the first six months of this year topped the total for all of 1955. The Nickel Plate Road reports a 48 per cent gain in the first eight months of this year.

Rail-Trailer Co., which has spearheaded the drive to combine the railroad service and common carrier trucks by acting as an agent for both, is expecting record business this fall. Last year's peak for Rail-Trailer was October's 3400 trailers. So far this year, the average has been between 2000 and 2500 a month.

Rates—Palmer Bayer, secretary of Rail-Trailer, points out that rates from May to August of this year were increased, creating a slight decline. But a revision in mid-August again makes piggybacking attractive to the truckers.

Rail-Trailer recently formed the Trailer Train Co. in co-operation with five railroads. This compa-

ny's chief function is to provide flatcars for piggybacking. It has 500 in the pool. Members can lease them as they need them.

One development promising versatility is the container type unit which can be loaded with a fork lift truck or overhead crane from flatcar to truck bed or vice versa. Spector Freight System Inc., Chicago, finds these units often eliminate one conventional trucking terminal operation. Shipments are loaded in the Chicago terminal according to a customer delivery route in New York. When the container arrives in New York, it is placed on a truck bed and delivered directly to the customer.

Something New — Earlier this year, the Chesapeake & Ohio Railway unveiled a hybrid truck trailer it's experimenting with. The "Railvan" trailer has two sets of wheels—rubber tires for highway use, flanged wheels for railroad track movement. The object is to eliminate the flatcar. C&O officials expect test results within a year.

Tie-down units for securing trailers to flatcars and terminal loading facilities present problems. But they are minor and being solved, claim enthusiasts.

The big hurdle is to gain wider acceptance of this transportation idea. All types of products are being handled via piggybacking—from tooth paste to candy to sheet steel buildings.

The Rules — ICC regulations make it difficult for railroads to start truck lines. It's easier for railroads to buy up established truck companies. You can expect more of this.

Another factor: Extension of piggybacking through interchange of service between railroads. The Pennsylvania, which operates its own truck line and also handles common carrier trucks, recently extended service from southwestern to eastern cities through interchange with other railroads.

Competition and customer service are the keys to piggybacking's growth. The railroads which have started it, acknowledge it has customer service advantages. For the service to achieve maximum effectiveness and versatility, major roads will probably have to carry common carrier truck trailers.

Fringe Payments Soar

One-fifth of the average American employer's labor costs goes for fringes. Pensions, insurance, vacations and paid holidays are most expensive items

HERE'S a quick picture of the growth of fringe benefits since 1929: That year, American employers paid out $1.5 billion for fringes. Last year, they put out $36 billion. Gross national product last year was $390.9 billion.

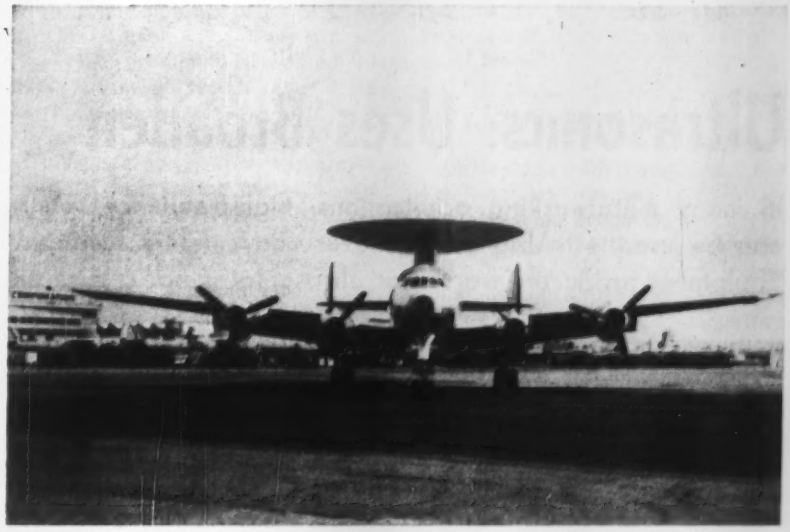
The figures are from a survey by the U.S. Chamber of Commerce, Washington. Dr. Emerson P. Schmidt, director of the chamber's economic research department, points out the moral: "Weekly wages and hourly rates are no longer an accurate measure of either worker income or the labor costs of doing business."

What's-What — Pensions, vacations, social security—these are the type of costs covered by the survey. They averaged $819 per employee in 1955, up $99 since 1953.

This annual average breaks down into $254 for negotiated pensions and insurance; $254 for vacations and holidays; $145 for legally required programs (unemployment compensation, old-age insurance and the like); $89 for rest periods; and $77 for miscellaneous benefits.

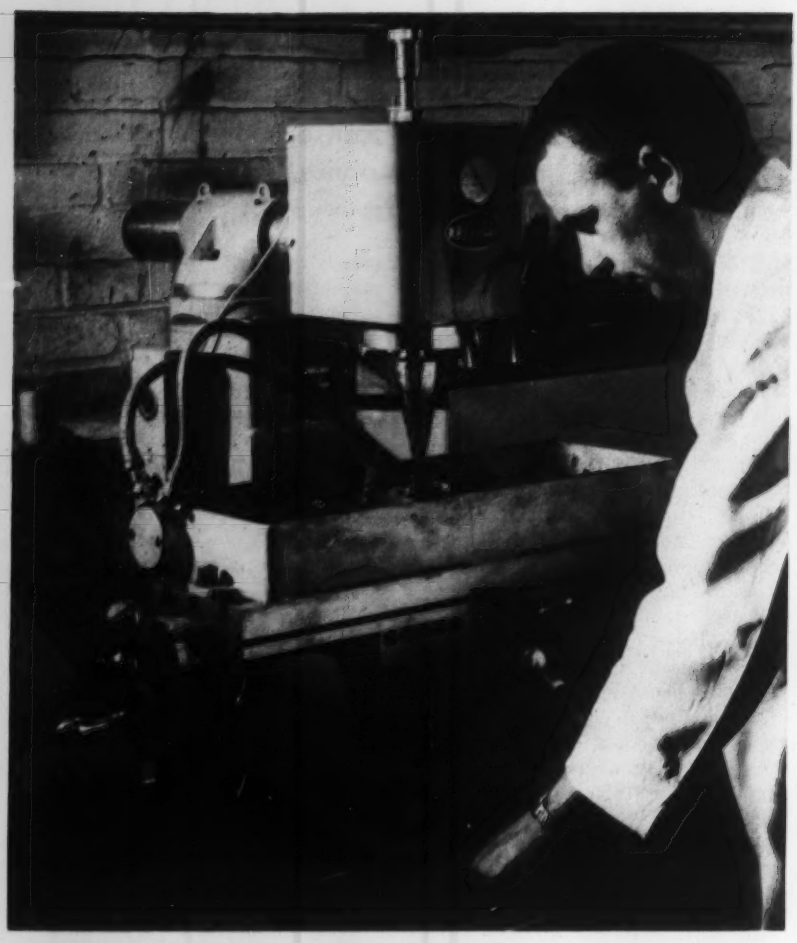
Comparisons — Payments for employee insurance were reported by 96 per cent of the companies surveyed. They averaged 2.1 per cent of payroll. Payments for pensions were reported by 75 per cent of the companies, with payments averaging 5.1 per cent of payroll.

There's a wide variation in the depth of the fringe benefit bite from company to company, points out the chamber. Total costs vary from less than 5 per cent to over 50 per cent of payroll. The average payment in 1955 was 20.3 per cent of payroll, or 39.2 cents per payroll hour. Highest payments last year were made by companies in the Northeast, followed by the western, east north central and southeastern regions.



Don't Shoot, It's Friendly

Flying saucers are really here, it appears from this photo of an experimental radar unit. The early warning installation is on a Navy WV-2 Super Constellation, designed and built by Lockheed Aircraft Corp. That disc-shaped saucer above the plane is a new type radome, containing radar antenna, developed in studies on advanced ideas in air-borne radar detection. The disc is more than 30 ft wide



Operator adjusts power setting of ultrasonic cutter at Raytheon Mfg. Co.

Ultrasonics: Uses Broaden

In many metalworking applications, high-frequency sound can be used with big savings over conventional methods. Equipment producers warn that ultrasonics is not a cure-all

ULTRASONICS is coming of age.

Nobody knows how big the business has become since its beginning after World War II. The consensus among members of the Ultrasonic Manufacturers Association is that this year's sales volume will run between $10 million and $20 million. Most of the seven UMA members look for a 20 to 30 per cent increase in 1957.

Conservative — The estimate is probably on the low side. Some of the 18 or more non-UMA outfits have suggested that annual gross sales are near $200 million, but William C. Potthoff, UMA president, explains: "It is the desire of UMA to try to eliminate the 'pie-in-the-sky' type of publicity that has been often released."

Ultrasonics already has found a firm market in medicine. Dallons Laboratories Inc., Los Angeles, produces a steady 3000 transducers a year for medical apparatus. Oscar Dallons, president, says: "We are not looking for an increase in this field and a saturation point may be reached within the next two years. We do look forward to a steady increase in industrial types of ultrasonic generators."

Industrial — Metalworking firms find ultrasonic devices useful in cleaning, testing for internal defects and gaging. The principle also is used in specialized soldering and brazing and experimental welding.

Raytheon Mfg. Co., Waltham, Mass., says more recent applications include descaling of steel, retardation of dendritic growth in molten metal to promote fine grain structure, thermoplastic sealing, surface machining and cutting.

Raytheon and Aeroprojects Inc., West Chester, Pa., have pilot plants where prospective customers can bring in problems and get help in developing ultrasonic production techniques.

Simple Theory—Sound waves do the work. Devices called transducers (generally quartz or barium-titanate crystals) are usually used to convert generated electrical energy into sonic energy.

Sound waves travel in the ultra-high frequency ranges (up to 15 million cycles per second). The ear, by comparison, can pick up sound impulses between 16 and 16,000 cps.

Example: Saginaw Steering Gear Division of General Motors Corp., Saginaw, Mich., cleans steering gear parts ultrasonically. The equipment, made by Circo Equipment Co., Clark (Rahway), N. J., operates at the "relatively low rate" of 40,000 cps in this application.

Savings — Is ultrasonics practical? Stanley Rich, president, General Ultrasonics Co., Hartford, Conn., cites this example: "A major color television manufacturer is using ultrasonic cleaning equipment to remove circuit inks from printed TV circuit boards. The equipment cost $10,000. Annual savings are $100,000."

Unfortunately, many customers seem to think ultrasonics will always save them money. Louis R. Jeffrey Jr., vice president, ALCAR Instruments Inc., Little Ferry, N. J., emphasizes: "A major problem facing manufacturers is the dissemination of information on what ultrasonics can do and what it cannot do economically." It's

not dollar wise to polish gear faces ultrasonically, but it may be worthwhile to use the high frequency sound to clean hard-to-reach surfaces between gear teeth.

Echoes — Other producers echo Mr. Jeffrey's plea for education and add some of their own. Detrex Chemical Industries Inc., Detroit, which makes about 75 per cent of all ultrasonic cleaning equipment, reports: "The most pressing problem is to reduce the cost per kilowatt, particularly on industrial cleaning applications where power required is in the range of 7.5 to 15 kw radio frequency."

Other problem areas are reducing design and development costs to shave end product prices and setting up standards for testing and measuring materials. It's hoped the Atomic Energy Commission will take steps in this direction.

Right now, ultrasonic manufacturers have their sights on the National Metal Exposition (Cleveland, Oct. 8-12). They plan to introduce equipment for descaling, machining and automated cleaning.

Predicts Revolution in Steel

C. L. Austin, vice chairman of Jones & Laughlin Steel Corp., says the steel industry is on the verge of major technical breakthroughs that will revolutionize steelmaking.

Mr. Austin, speaking at the sixtieth anniversary dinner of Wellman Engineering Co., Cleveland, gave these examples:

1. Potential development of direct reduction of ores to metallic iron.

2. The oxygen converter method of making steel which J&L will introduce soon at Aliquippa, Pa.

3. Shaping of steel by hot extrusion with a die instead of rolling, casting or forging.

4. Continuous casting of billets and slabs from molten steel.

5. Automation. (Mr. Austin described an electronic card-programmed control system for a new reversing roughing mill being installed in Cleveland.)

6. Advance in beneficiation and agglomeration of low-grade ores.

7. New techniques in blast furnace operation.

Guide for Better Profits

Four out of five new products fail. Manufacturers can improve upon this record. Speakers at National Industrial Conference Board meeting tell how

EIGHT YARDSTICKS, if applied critically, can result in better profit margins on new or old products or products of companies you are thinking about buying, asserts Robert M. Oliver, vice president, marketing, Thomas A. Edison Inc.

Mr. Oliver told the fourth marketing conference of the National Industrial Conference Board that producers should apply these questions to the problem: 1. Do you have *people* with the know-how? 2. Do you have the *money* to produce it? 3. Is your *plant* suited to the economical production of the product? 4. Will your *name* help sell it? 5. Is the *market* large enough to warrant your best efforts? 6. Will *volume* of sales be high enough? 7. Can you achieve *leadership* in the product? 8. Can you make a *profit* on the over-all product as well as all its models?

Key Word—"Because we are in business to make money, the key word in any product policy is profit," Mr. Oliver says. Four out of five new products introduced in today's market fail because they can't show a profit.

"Insufficient planning and lack of adequate preparation constitute a prime contributing factor," says D. R. Hull, vice president of Raytheon Mfg. Co. He feels that in preparing to market a new product, top management must have adequate insight into the type of market, its geographical limitations, seasonal demand, method of distribution, patentability, pricing and prospects of continued demand once the product ceases to be new. "A new product needs to be defined from the consumer's viewpoint rather than from that of the company or industry offering it," he claims.

More Details—George A. Dauphinais, vice president and general manager of Quaker Rubber Division, H. K. Porter Company Inc., says that, in addition, a company should determine: 1. What is the trend for the product? 2. What will be the effects of demand on present production? 3. Who is the competition? 4. What are the competition's policies on pricing, packaging, advertising, promotion, warranties and factors affecting capital considerations? 5. What portion of total demand can the new product expect to capture?

The conference speakers were practically unanimous in the opinion that organization is paramount in all these considerations. Earl A. Clasen, director of marketing, Pillsbury Mills Inc., believes more new products will be successful: "If we pay proper attention to our research finding, critically analyze and evaluate the data on the number of consumers trying our products and the repeat purchasers using our products and constantly challenge our research people to develop alternate formulas, better packaging, improved product efficiency and new and unusual ideas."

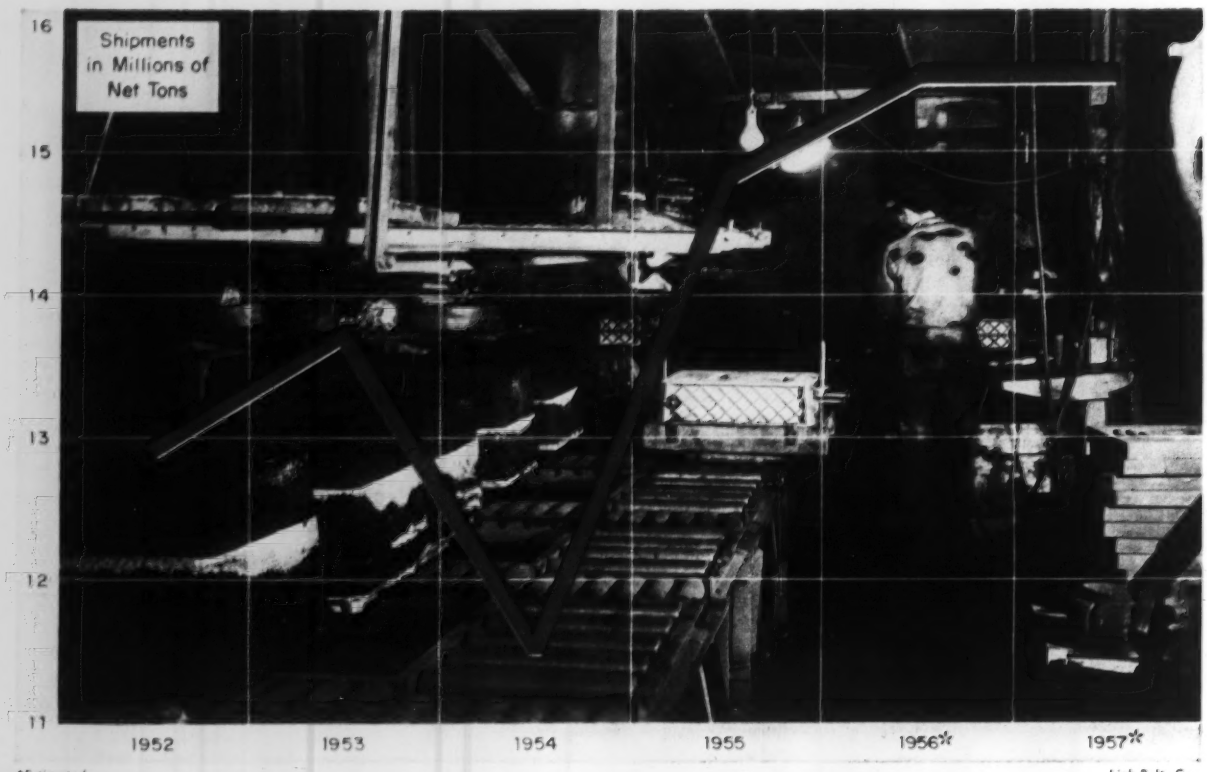
Air Force Sells Surplus

During the 1957 fiscal year, the Air Force will dispose of $1¼-billion of excess property.

The disposal program, administered by the Air Materiel Command, Wright-Patterson Air Force Base, Dayton, O., is a continuation of a similar one last year under which nearly $1 billion worth of parts and equipment were processed.

Excess property will be screened for re-use with priority given to: 1. Other military agencies. 2. Federal agencies of the government. 3. Qualified agencies and organizations such as schools and the Boy Scouts.

Property not redistributed will be offered for sale to civilians. Announcements will be made as items become available.



*Estimated.
Source: U.S. Bureau of the Census

Link-Belt Co.

Gray Iron Seeks Record

Production for the first half is slightly behind 1955's pace, but an expected strong pickup in the last quarter may boost shipments over 1951's record 15 million tons

GRAY IRON founders have a good chance to break their production record, even though their biggest customer, the auto industry, has taken its lumps this year.

The 1951 record, 14,988,555 net tons of castings shipped, was nearly toppled by last year's shipments of 14,837,745 tons. Only a slow start in January and February kept last year from setting a new high.

This Year—At the end of six months, shipments were about 75,000 tons behind the 1955 pace. But strong demands from makers of machine tools and an expected spurt in auto production in the last quarter lead Donald H. Workman, executive vice president of the Gray Iron Founders' Society, to predict that 1956 shipments will exceed last year's by 5 per cent.

Looking Ahead—The good business is not transitory. Mr. Workman expects volume in 1957 to be just as good or better than this year's. A big potential, he thinks, lies in the road building programs.

With good business, foundries have been able to pass along increased costs to their customers. Price increases of 4 to 9 per cent have been common recently. And F. J. Sherwin, president, Chicago Hardware Foundry Co., North Chicago, Ill., warns: "If the scrap quotations don't change or continue to increase, you'll probably see a further increase in gray iron prices before the year is out."

The Situation—In the last six months, pig iron has gone up $4 a ton, coke $2 a ton, steel scrap as much as $13 a ton, cast scrap as much as $3 a ton and steel rails about $15 a ton.

If tight ore supplies cause the steel mills to step up scrap buying, the resulting higher prices will hit the foundries. (Part of the cupola charge is made of the same grade of scrap used by the mills.)

The need for keeping a tight rein on costs has been emphasized by the recent record of foundry failures. In the latest count (1955) by *Penton's Foundry List*, there were 2402 gray iron foundries, a net decrease of 666 since the postwar high in 1947. There have been years when more than 100 gray iron foundries closed their doors.

Mr. Workman says the number of foundry failures has slowed down in the last few months. He believes most of the potential failures operating after World War II were eliminated by the dips of 1949 and 1954. Now there will be fewer failures because the hangers-on have been eliminated.

An Advantage—One good has

come out of these failures. They have indicated the need for foundries to develop their markets. The Gray Iron Founders' Society has initiated a market development program which it expects will be as helpful to its members as its cost accounting program.

While some foundries failed, others enlarged their markets. Many castings are being shipped more than 300 miles. H. S. Faust, president, Hansell-Elcock Co., Chicago, says: "We consider a 500-mile radius from Chicago our potential, although we're shipping as far away as New England currently."

Summing Up—The list of new developments is becoming a long one—mechanization, shell molding and coremaking, the CO_2 process, ductile iron, high pressure molding, new melting practices and new cupola designs.

Chicago Hardware's F. J. Sherwin says: "If the trend continues, we could see the foundry industry doing 25 per cent of its volume in ductile iron and shell molding in five or six years."

Some foundrymen have noticed castings becoming more complicated. They say design engineers have set out to reduce weight and machining. Result: Castings are more complex, require more cores.

Republic Boosts Barrels

A plant for the production of steel barrels will be built by Republic Steel Corp. near Charleston, W. Va.

The new building will have floor space of about 45,000 sq ft and facilities to produce more than 1 million barrels a year.

Alabama Tube Plant Enlarges

Wolverine Tube Division of Calumet & Hecla Inc. will expand the productive capacity of its Decatur, Ala., plant by 40 per cent.

Construction will start late this year; completion is scheduled for the middle of 1958.

A bay, 75 x 1200 ft, will be built to increase production of copper and copper-base alloy tubing and fabricated tubular products. A 3000-ton extrusion press will be added.

More Titanium

By the end of 1957, Industrial Chemical's new plant will make 5000 tons of sponge yearly

A NEW process will be used to make titanium sponge at the Ashtabula, O., plant of U.S. Industrial Chemicals Co., division of National Distillers Products Corp.

Dr. Robert E. Hulse, vice president of National Distillers, says a high purity sponge will be produced by reducing titanium tetrachloride with metallic sodium.

The sodium will come from U.S. Industrial's nearby sodium-chlorine plant, while the titanium tetrachloride will be produced by Stauffer Chemical Co., New York, in a new plant which it plans to build in the area. Stauffer, in turn, will use chlorine from U.S. Industrial's plant.

Combination—The titanium plant and a zirconium plant that can produce 750 tons a year will be located in a 175,000-sq-ft building recently purchased from Lake City Malleable Iron Co.

The structure, built 12 years ago as a production-line foundry, will have ample space for both facilities. U.S. Industrial expects to save from six months to one year of construction time by using the building. Construction of a 10,000-sq-ft control laboratory already is under way. Other projects will be started as soon as foundry equipment can be removed.

Growth—Production of titanium sponge has grown from 3 tons in 1948 to an estimated 12,000 to 13,000 tons this year.

More expansion is planned. Titanium Metal Corp., New York, will boost its sponge capacity from 3600 tons annually to 7200 tons. E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., is doubling its 3600-ton capacity. Cramet Inc. will boost capacity to 6000 tons at its Chattanooga, Tenn., facility.

New producers will include Union Carbide & Carbon Corp., New York, 7500 tons; and Dow Chemical Co., Midland, Mich., 1800 tons a year.

Sawhill Expands Pipemaking

A $3.5-million expansion program has been scheduled by Sawhill Tubular Products Inc. for its Mercer Pipe Division, Sharon, Pa.

Ray F. Eisenbies, president of Sawhill, says the program includes installation of a new 12-stand continuous weld pipe mill. The addition of 50,000 sq ft of buildings and pipe finishing, testing and handling equipment is expected to be completed by the middle of 1957.

Alco Products Expands Beaumont, Tex., Plant

Machine shop, warehouse and office were expanded in a $2-million program. Alco Products Inc., Schenectady, N. Y., says production of heat exchangers and oil field equipment for Southwest will be boosted substantially

Tool Replacement Bogs Down; Program Set Back to 1958

The Defense Department's machine tool modernization program is having trouble getting off dead center. Announced early this year, the program was to begin updating nearly $3 million worth of machine tools during fiscal 1957. A new directive floating through Pentagon channels will push the program to fiscal 1958. The directive also hints that a Senate Small Business Committee recommendation to boost the 2 to 5 per cent replacement rate will be ignored.

Needed: New Materials

Aircraft advances now depend on "major breakthroughs" in materials. Lt. Gen. C. S. Irvine, deputy chief of staff, materiel, warns that it won't be enough just to advance the state of the art. The problem, he says, is to "come up with something revolutionary, something that changes our entire thinking." Today's systems "have reached a state of development and complexity where progress is almost always limited by our knowledge of available materials." Within four years, he says, turbojets will be capable of speeds of Mach 3, will operate at temperatures up to 2500°F. Missiles, pushing Mach 20, may require materials that will stand up to 10,000°F.

Needed: New Tools

We also need to know more about machining the supermaterials, according to General Irvine. In a recent AF test, a special-purpose machine hogged out 300 cu in. of aluminum in a minute. The same device, tackling a titanium alloy, only took ⅓-cu in. a minute. "Our ability to manufacture and mass produce parts from materials under development," he warned, "may be retarded to the point where the value of using them . . . cannot be justified in dollars and cents."

New Look in Aircraft

The Navy Bureau of Aeronautics revised its research and development department around the weapons-system concept. Contracts will be let on the basis of an engineered, integrated package instead of contracting for armament, controls, propulsion, etc., with integration coming later. The system puts more emphasis on planning and pre-engineering. The first contract to go out under the new plan: North American Aviation Inc. is to develop a new supersonic, twin-jet bomber which will be carrier based.

SBA Opens Books

The Small Business Administration approved 100 business loans worth $4,263,690 from Aug. 16 to 31. Wendell B. Barnes, SBA administrator, says this runs the total to $182,925,278 for 3987 business loans granted since the agency went into business in October, 1953.

CAA Retubes

Contracts for $1,544,631 worth of electronic tubes have been awarded by the Civil Aeronautics Administration, Department of Commerce. James T. Pyle, acting administrator, says they went to 39 contractors. The tubes, 445,994 of them, will be used to keep the CAA's airways facilities going throughout this fiscal year.

India Gets Top Loan

The World Bank loaned $396 million during the year ended June 30, 1956. Net income for the period was $29.2 million, a record. Industry in India, Japan and Pakistan got a total of $93 million.

Meet J. Robert Jones, vice president in charge of sales for Kearney & Trecker Corp., Milwaukee. He will serve for about six months as director of Business & Defense Services Administration's Metalworking Equipment Division.

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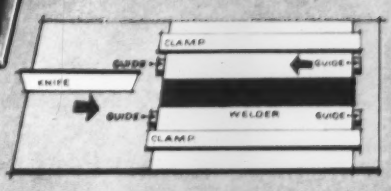

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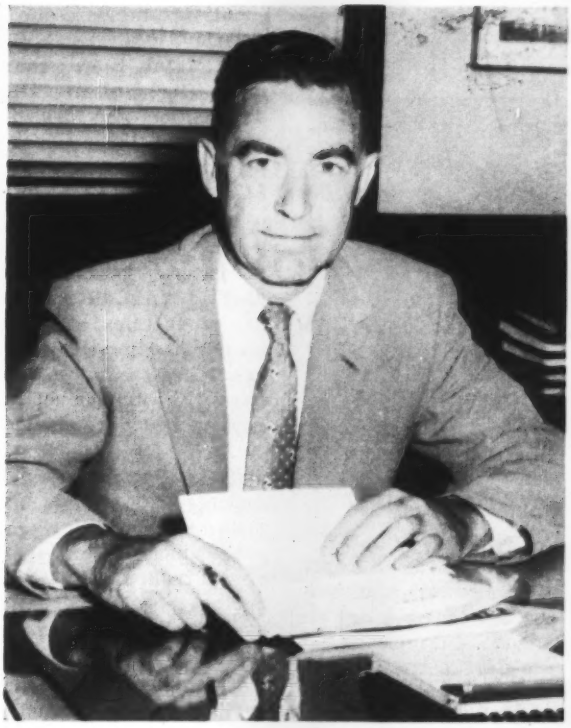


Jim Rayburn of L&S: Freedom To Err

JIM RAYBURN, vice president of sales at Lamson & Sessions Co., believes that any man in a position of authority should have the freedom to err. But along with that freedom go the responsibility for his decisions and the requirement that he get things done.

"The key words in our organization are authority and responsibility," says this 40-year-old executive for the Cleveland fastener manufacturer. "We want our sales people to make their own decisions, which means we have to give them a fair amount of authority. In fact, in their own territories, they are practically autonomous. We also recognize that a man in that position may make mistakes, so we make him responsible for his decisions. It's sort of an incentive system. Because we pick our men of authority with care, we find that the system pays off for both the salesman and the company."

Strength Within—Every man in the company is thoroughly indoctrinated into this system before he is put out on his own, Mr. Rayburn points out. This results in good in-company promotion, which is an aid to the incentive system. "We haven't had to go outside the company to fill an important vacancy for years," he says.

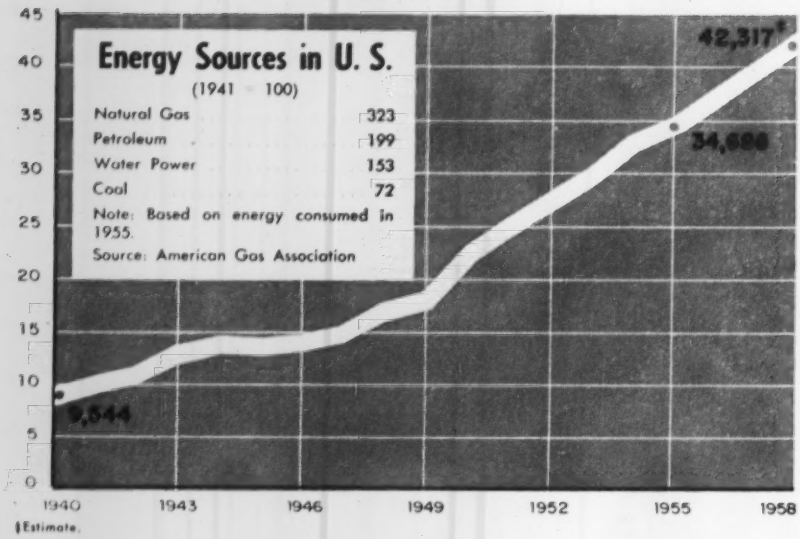
But the responsibility of the individual doesn't stop at his own territory. "Lamson & Sessions is a team operation," Mr. Rayburn declares. "We're a committee-run company. If we have a particular sales problem or plan, we sell it to top management right down to the plant manager. When a decision is made, it's hard to say who made it. This decentralization is a bit slower than placing all authority in one individual or policy group, but it has the advantage of across-the-board thinking on the problem."

Another Key—Service is another key word at L&S. "We have at least two men who are familiar with each account, assuring the customer of prompt and accurate service. You might say we sell service as much as we sell bolts and nuts."

Jim Rayburn is a product of this company policy of responsibility and authority. A native Tennesseean with a soft southern drawl, he joined Lamson & Sessions in 1945 after serving three and a half years in the Air Force. Like many other companies at that time, L&S had a wide gap between the youngest and oldest management groups. Mr. Rayburn started as a trainee with his own territory and worked his way up. He was general sales manager until last Wednesday (Sept. 26), when he became a vice president.

Industrial Gas Sales

(Millions of therms)



Gas Plays a Bigger Role

It supplies 26 per cent of the nation's total energy requirements. In 1940, the figure was only 12 per cent. Pipeline and facility expansion will continue

ON AUG. 16, a ceremonial opening of valves at Sauvies Island, Oreg., marked the entry of natural gas into the Pacific Northwest, the last region of the U.S. to be supplied. (Vermont remains the only state without natural gas.) Behind the ceremony: 1487 miles of pipe running from southern Colorado.

This year also saw the industry achieve another long awaited goal. Central heating of homes by gas has nearly doubled since 1951, to nose out oil and take a long lead over coal. Some 10.2 million homes have gas furnaces, compared with 10.1 million with oil and 7.5 million with coal.

More Expansion — Not content with these laurels, pipeline and utility companies expect to spend $7.3 billion for new construction and expansion of facilities in four years, 1956 through 1959, says the American Gas Association. That compares with $4.8 billion spent from 1952 through 1955.

Forecasts W. F. Rockwell Jr., president, Rockwell Mfg. Co., Pittsburgh, and president, Gas Appliance Manufacturers Association: "The nation's gas industry, which has been a leading force in our expanding economy, will assume an even more important role in the expansion of other industries."

Background — Typical uses of gas in metalworking include heat treating, melting, diecasting, hot forming, tempering, drawing, annealing, carburizing and hardening.

Prior to World War II, gas consumed by all industry totaled 863 billion cu ft a year (1939). By 1945, consumption hit 1434 billion cu ft, and by 1955 it was almost 3500 billion cu ft—a record performance in a booming American economy, as well as a rapidly expanding natural gas industry. Points out the AGA: "While industrial production has increased 240 per cent since 1939, the use of gas in industry has increased 300 per cent. Gas now furnishes approximately one-fourth of the country's energy requirements."

Today, natural gas pipeline systems total more than 500,000 miles (included are transmission, distribution and field lines). By the end of 1956, gas utilities and pipeline companies will have about $17.5 billion invested in plants and other facilities.

New Reserves—Proved reserves of natural gas have more than doubled since 1940 despite a rate of production which has been steadily setting records year after year. Reserves at the end of 1955 were 223.7 trillion cu ft; net production last year was 10.1 trillion cu ft.

The industry is building more underground storage facilities to insure adequate supplies during the peak winter demand period. Last year 2 trillion cu ft went into storage in the U.S. Since 1951, storage capacity has been boosted 1.2 trillion cu ft.

East Ohio Gas Co., Cleveland, typifies the peaks and valleys of gas demand in the northern half of the country. On one winter day last year the company sold 1.35 billion cu ft of gas; on a summer day, sales were only 195 million cu ft. From mid-April to mid-November, East Ohio pipes as much as 140 million cu ft of gas a day into storage wells to handle the peak winter load.

More Production—To turn dry holes into producing wells and to increase the deliverability of storage wells, the natural gas industry has come up with a process called hydraulic fracturing. First used in 1951, the method fractures the gas bearing sand with various liquids under high pressure. These splits provide avenues along which the gas can escape to the well bore.

One East Ohio well which had been rated at a capacity of 14,000 cu ft produced 2.3 million cu ft after it was fractured. The big drawback to the process: Wells which have been blasted with nitroglycerin don't react to hydraulic fracturing.

As the spreading network of pipelines brings gas to more metalworking companies, you can expect gas equipment makers to aim for a bigger share of the equipment market.

New Equipment — Gas equip-

ment manufacturers have been getting their share of increased industrial furnace sales this year, reports M. A. Combs, secretary, Industrial & Commercial Gas Section, AGA. (In the first seven months, new orders for industrial gas and electric furnaces totaled $71.6 million, compared with $46.7 million for the same period last year.)

Several firms have expanded their plants this year.

Among new developments in gas-using equipment for metalworking is a direct flame hardening machine made by Gas Appliance Service Inc., Chicago. Installed at Hushek Metal Processing Co., Milwaukee, the machine handles circular shapes from 6 to 60 in. in diameter, with face widths up to 12 in.

Lindberg Industrial Corp., Chicago, maker of custom built gas furnaces for field erection, has recently installed a gas fired, car type annealing furnace at the Chicago plant of Clearing Machine Corp., a division of U.S. Industries Inc. Its capacity is 200 tons.

U. S. Gas Reserves Gain on Production

(Trillion cu ft)

	Reserves	Production
1955	223.7	10.1
1954	211.7	9.4
1953	211.4	9.2
1952	199.7	8.6
1951	193.8	8.0
1950	185.6	6.9
1940	85.0	3.3

Source: American Gas Association

Natural Gas at Work

To simulate supersonic speed at high altitudes in National Advisory Committee for Aeronautics' Lewis Laboratory, Cleveland, 256,000 cu ft of gas per hour dry out activated alumina beds which, in turn, dry out the air for the wind tunnel

Research — Applied research, leading to custom built equipment, is the heart of the gas equipment manufacturer's business. Notes Selas Corp. of America, Philadelphia: "Even in the physical structure of our plant, research facilities are the hub of the wheel."

Selas' laboratory staff of development and ceramic engineers is currently conducting investigations at the rate of $350,000 to $400,000 a year. Comments Selas: "About one-third of this activity is directly connected with the processing of metals in one form or another. At least another third is concerned in a general way with combustion and heating processes, and should prove useful in future metal processing developments."

Selas moved into a new plant in February, and more than doubled the physical content of its laboratory facilities at that time. A force of 28 engineers and scientists will be expanded to 40 by some time next year.

Sales Outlook—Another leading manufacturer of gas operated industrial furnace and steel mill equipment reports last year's sales increased over 400 per cent from 1954's. An increase of 5 per cent is expected in 1956. The firm's expenditures for research this year will be 40 per cent higher than 1955's.

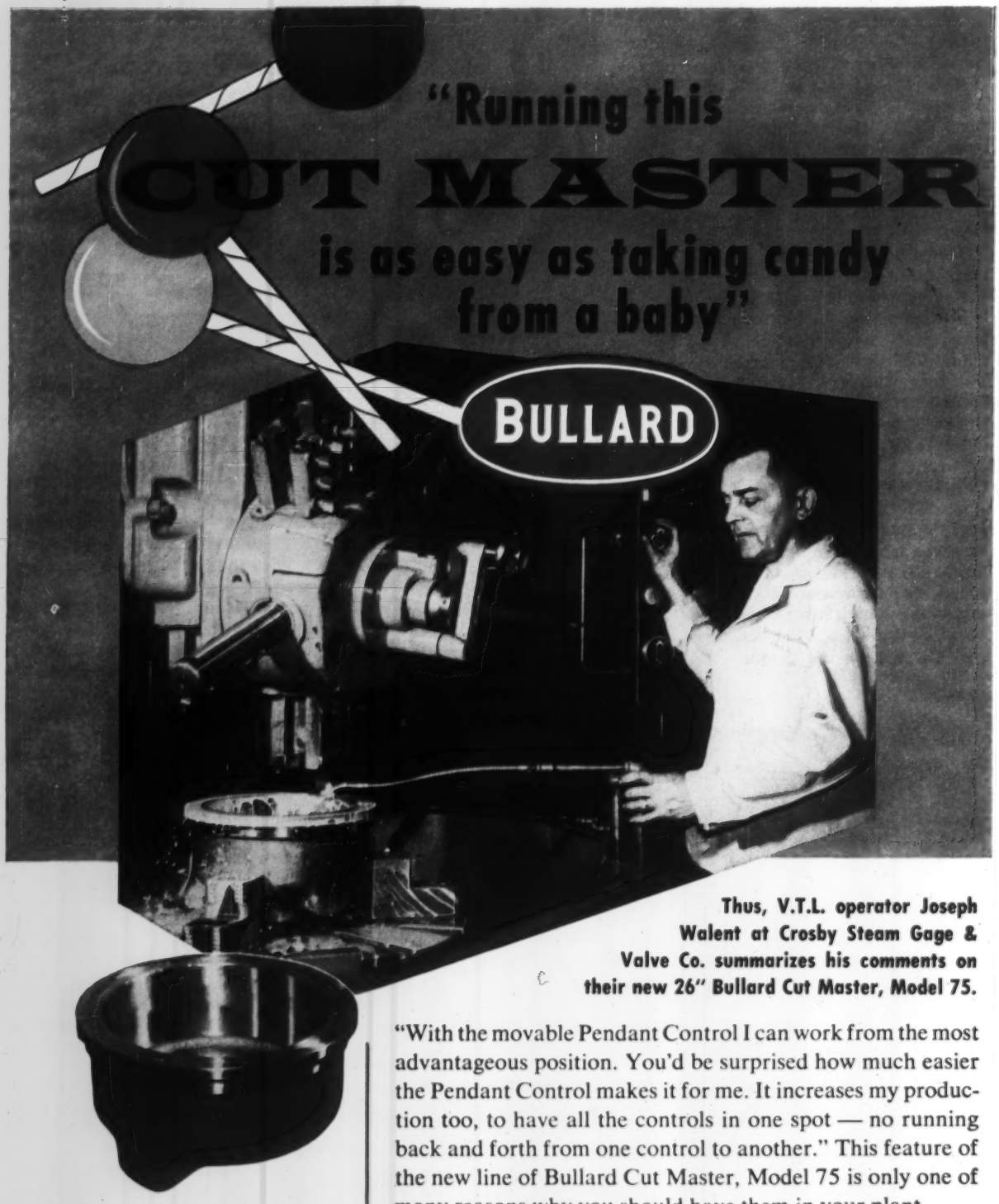
Research plans in the field include automation and gas chemistry as applied to heat treating, this company says. Its engineers are developing completely mechanized heat treat furnaces to be integral parts of automatic production lines. Also in sight: The development of gas generators with automatic control equipment.

With the FPC—Here's the latest news of pipeline expansions. Tennessee Gas Transmission Co. has filed with the Federal Power Commission for permission to construct additional facilities, including: 1. 1085 miles of pipeline. 2. Six compressor stations. 3. Expansion of seven stations. 4. A new underwater crossing for the Mississippi river. It will be a triple pipeline.

New facilities will cost about $166 million and will add 456 million cu ft to Tennessee's average daily delivery capacity. Total Tennessee capacity will be 2.5 billion cu ft per day when all facilities now under construction or covered by FPC applications are put into service.

FPC Chairman Jerome K. Kuykendall reports pipeline facilities costing $461.4 million and designed to add 2.25 billion cu ft of daily capacity were authorized by the agency in the 12-month period ended June 30. Included are 4400 miles of pipeline and 255,000 hp in compressor units.

New Factor—The latest development in the gas industry's fight for more business is gas operated air conditioning. Look for it to challenge the current market superiority of electrically operated equipment, and provide a big push toward an air conditioned America—in the home, as well as in commercial and industrial structures.



Thus, V.T.L. operator Joseph Walent at Crosby Steam Gage & Valve Co. summarizes his comments on their new 26" Bullard Cut Master, Model 75.

"With the movable Pendant Control I can work from the most advantageous position. You'd be surprised how much easier the Pendant Control makes it for me. It increases my production too, to have all the controls in one spot — no running back and forth from one control to another." This feature of the new line of Bullard Cut Master, Model 75 is only one of many reasons why you should have them in your plant.

Why not get the full story — ask for a catalog by calling your nearest Bullard Sales Office, Distributor or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONN.

Pontiac Stretches Tool Life

Auto maker gets multiple benefits from tool control system. Tool life, machine repair, tool sharpening and maintenance are shown by combination IBM-Cross arrangement

PONTIAC's V-8 engine line is using an IBM system to maintain an accurate history of tool life. It's saving the GM division thousands of dollars every year by cutting down time and providing a better timetable for changing tools.

Many machine shops use a hit and miss method for tool changes.

Thomas M. Seavey, Pontiac's general master mechanic, feels the trend to automation doesn't permit such haphazard operation. Unscheduled down time can hold up a whole line, he says. Mr. Seavey decided to install an IBM tool life system to find out how machines were running and to establish proper tool life settings.

Setup — Pontiac's IBM layout centers on tool control boards made by Cross Co., Detroit. There is a board for each section of tools. It contains a series of tool life counters (toolometers), preset replacement tools and setup gages. IBM cards are placed in racks on the board. Each card is prepunched for a group of similar tools. It shows the board number, machine number and tool description.

When a setup man has to change a tool, he picks a corresponding card and fills in the date, shift, toolometer setting and the meter reading. He also indicates how many tools in the group are changed and why. The cards are signed by the setup man and foreman. They accompany the tool to the crib.

Analysis — Cards are collected twice a day and the tools checked by a tool analyst. Arthur Keeley, who set up the IBM system, does this job. He checks off on one section of the card whether the tool ran too long or if it could have run longer. He also jots down the vendor identification on each tool.

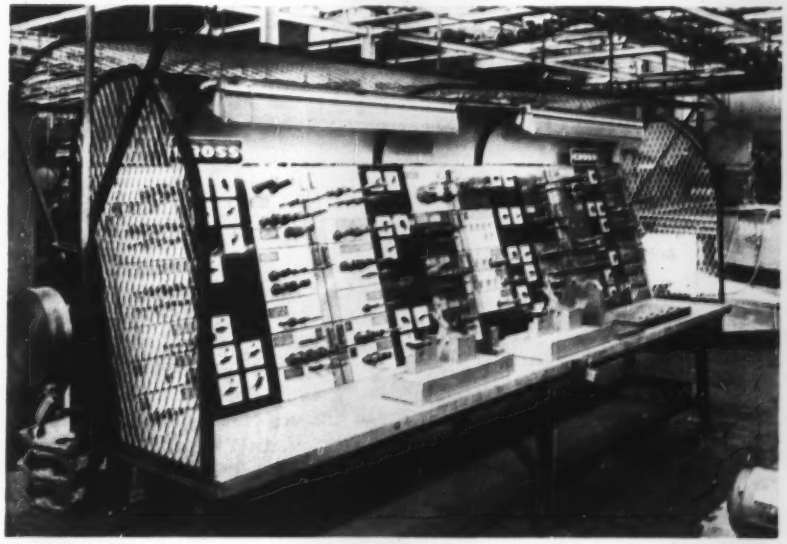
The cards are sorted and run through an IBM carder. Results are compiled on master records which show a history of each machine. They're checked weekly and monthly. Result: Tool engineers can quickly spot machines which consistently need changes and make repairs before they have costly breakdowns.

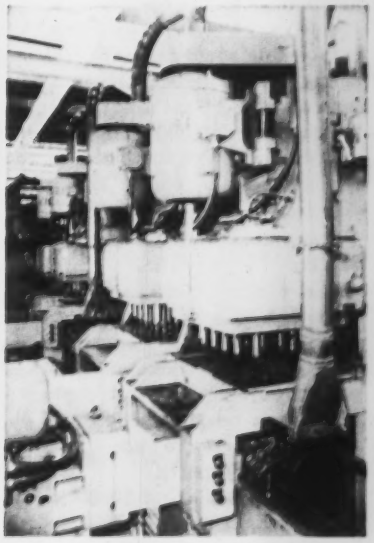
Quick Check—Mr. Seavey puts it this way: "Without the IBM system, we might repair a tool several times before we'd realize trouble would recur. With IBM histories, we can spot trouble early."

Mr. Keeley admits that while the tool life system is excellent for preventive maintenance and in making vendor comparisons, it still isn't the perfect answer in determining how long a tool should run before being changed.

Setbacks—"Our toolometers can be adjusted by anyone. A tool may have 50 units to go before it's due for a change, but the job setter or machine operator is going off shift, so he sets the meter back, say to 150 units. The next shift sees the tool is almost ready to change, but that operator has just started to work, so he sets the toolometer back another 200 to 300 units."

Pontiac ran a check on 375,000 engine blocks. According to IBM records, some tools only worked





At Pontiac, Cross tool control boards (above) are used with an IBM system to check engine block machining tools (right)

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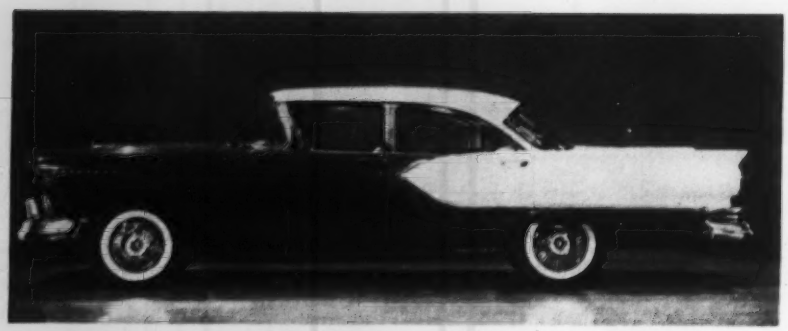


Ford's Sedans Go Hardtop

Though built with conventional center pillar, some '57 Fairlanes have slimmer lines in pillar, window frames and roof. Results: Sedans with the hardtop look. The Fairlane series also includes two and four-door pillarless body designs

on 200,000 of the blocks. Chuckles Mr. Seavey: "It looked like half of those blocks had gone out with no holes in them, but the men had changed toolometer readings. The difference between the number of completed parts and the IBM records proved it."

Since the division's tool engineers aim for a 10 rather than 50 per cent variation between finished units and meter readings, Mr. Seavey is starting a program to educate setup and machine men.

Hard Spots—Another headache is variations in part hardness. "Every so often we get a batch of blocks with hard spots in them which burn out drills in a fraction of their normal life," mourns Mr. Keeley. Closer co-operation with foundry quality control people is helping.

Even with these problems, the engine line averaged only 400 tool changes a day during the 1956 production run. That's based on approximately 50,000 tools. Without the IBM system, total tool changes easily could have been doubled.

Adaptable — Although Pontiac prefers to use IBM cards with Cross control boards, Mr. Keeley says they can be used separately. "We have a few sections operating only with IBM records, but it means setup men have to enter more data on the cards. We find it works best to use them together," he reports.

Pontiac uses about 1000 cards to keep track of 50,000 working tools. Mr. Keeley estimates it takes about 8 man-hours a day to check tools and compile records.

Uncomplicated—Mr. Seavey believes a lot of companies shy away from IBM records because they think the system will be too difficult. "I thought so too, at first, but I soon found it's not true."

Pontiac also uses IBM cards to keep track of machine repairs, tool sharpening and maintenance on toolroom fixtures. Other GM divisions are investigating the system. Chevrolet is just getting its IBM layout under way.

The Safety Auto

Auto stylists may shudder, but safety experts from Cornell University and Liberty Mutual Insurance Co., have collaborated to design a crashproof car.

Although the vehicle resembles a car, its height and humped roof are a far cry from the long lean lines touted by today's stylists. The biggest changes are inside.

Padded—The steering wheel is gone and a hydraulic, two-handled lever control faces the driver who is seated in the center of the car. The lever is parallel to the floor and covered with a chest pad to absorb impact. Behind it is a webbed yoke to catch oncoming drivers. The whole affair slides out to meet the steerer when he is ready to go.

Seats are of the bucket type, surrounded with webbing and straps. One seat is placed back to back with the driver. Corrugated rollover bars are built into the roof. Doors slide back and forth like accordion folds and have positive locks to keep them in place in a crash.

Bumpers are built to induce glancing; not crashing. An overhead air scoop does away with the possibility of inhaling fatal fumes from exhaust pipes. Instrument panel lights all glow green when everything's O.K., red if any part of the car is out of whack.

Although the congressional committee investigating auto and highway safety hasn't commented on the automobile, Detroit carbuilders are emphatic: "It may be safe, but it sure won't sell!"

U. S. Auto Output

Passenger Only

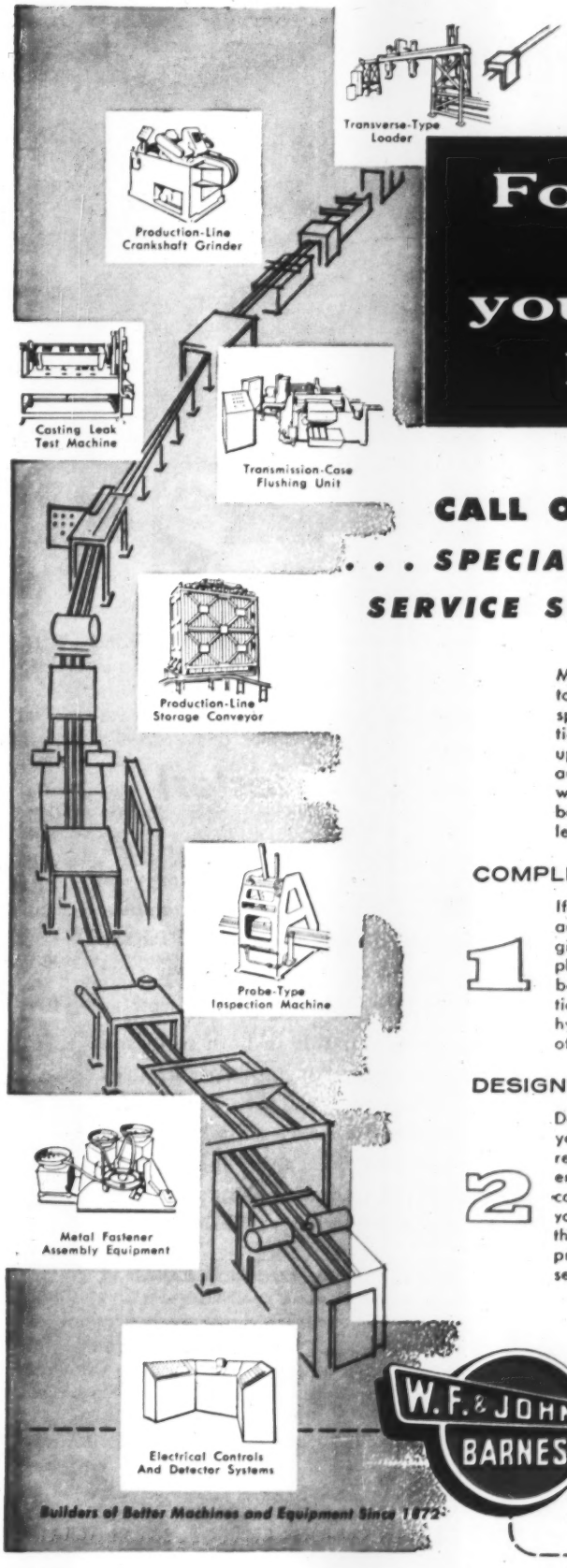
	1956	1955
January	612,079	659,508
February	555,596	675,495
March	575,234	794,015
April	547,766	753,851
May	471,533	724,892
June	430,279	649,393
July	448,804	659,763
August	401,997†	614,493
8 Mo. Total	4,043,288†	5,531,410
September		461,591
October		517,813
November		749,061
December		682,257
Total		7,942,132

Week Ended	1956	1955
Aug. 25	69,977	129,591
Sept. 1	58,233	85,851
Sept. 8	47,771	79,366
Sept. 15	64,350	122,263
Sept. 22	40,086†	123,109
Sept. 29	32,000*	115,723

Source: *Ward's Automotive Reports.*
†Preliminary. *Estimated by STEEL.

Exhaust Notes

- GM Fisher Body divisions have absorbed Packard's steel stocks. Buick Division is offering hot-rolled sheet for sale.
- Ford Motor Co. will make its convertible hardtop available after the first of the year. Ford wholesale prices will be up an average of $53, says R. S. McNamara, Ford general manager and company vice president. Tooling costs for the 1957 Ford total $209 million.
- Chevrolet goes into 1957 model production today (Oct. 1). E. N. Cole, division general manager, predicts sales of 2 million next year. This year's Chevvy sales are estimated at 1.8 million. Tooling costs for 1957 are pegged at $130 million.



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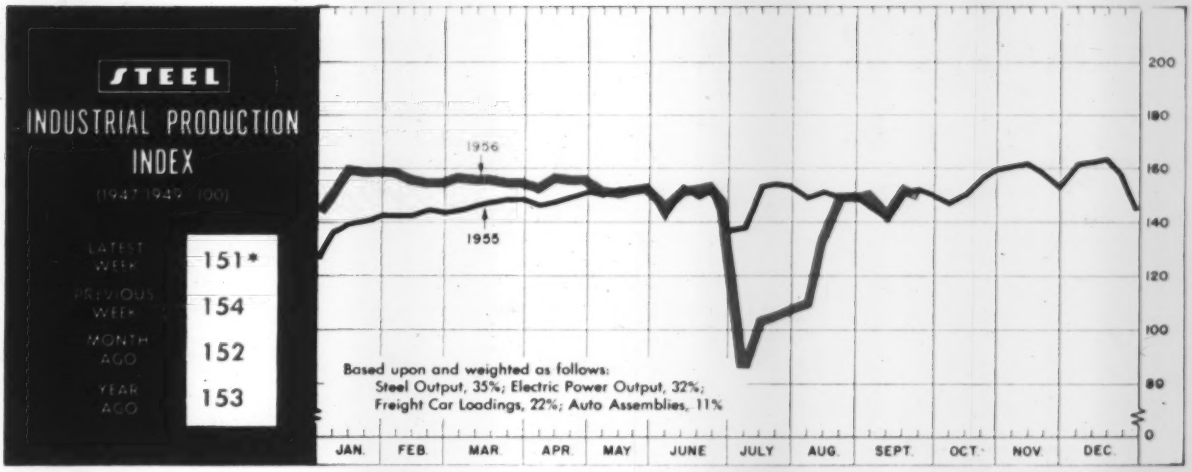

*Week ended Sept. 22.

Prognosticators Predict Record 1957

NOW that the fourth quarter is pretty well "locked in," and at capacity rates in most cases, crystal ball gazers are looking into 1957. The view is clear and bright.

Next year looks like a continuation of the high-level activity of 1955-56. With new capacity, a year even better than the current one is in prospect. At the forefront, as in 1956, will be steelmaking, machinery and construction, with a major assist from the automobile industry. This outlook was highlighted at the fourth marketing conference of the National Industrial Conference Board in New York.

On Limb—Howard V. Clark, executive vice president of Detroit Steel Corp., predicts the steel industry will turn out about 119 million to 120 million tons of ingots during 1957. This will be about 90 per cent of the new capacity. Approximately 132 million tons will be in place on Jan. 1 (see STEEL, Sept. 17, p. 134). Much of the increased demand will come from the automotive industry, which Mr. Clark thinks will turn out close to 6.75 million passenger cars. Other big factors will be farm machinery, railroad equipment and containers.

Machinery and equipment companies will increase sales an average of 6 per cent over 1956's, says Irwin T. White, sales manager for the Gradall Division of Warner & Swasey Co. He predicts construction equipment will be 20 to 25 per cent better; machine tools, 20 per cent; textile machinery, 5 to 8 per cent; and farm equipment, 10 per cent.

Sure Thing—There is little doubt about construction in 1957. It will exceed the record (over $44 billion) which will be set this year. (The industry has maintained its record pace since the end of World War II.) Wade W. Hidinger, vice president of National Gypsum Co., bases this prediction on increases in industrial and public construction, plus 1.1 million to 1.2 million housing starts. This would be

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,466[1]	2,477	2,341
Electric Power Distributed (million kw-hr)	11,450[1]	11,339	10,756
Bituminous Coal Output (1000 tons)	10,645[1]	8,730	9,915
Petroleum Production (daily avg—1000 bbl)	7,050[1]	7,049	6,671
Construction Volume (*ENR*—millions)	$380.7	$372.5	$433.0
Auto, Truck Output, U. S., Canada (*Ward's*)	57,889[1]	86,738	151,804
TRADE			
Freight Car Loadings (1000 cars)	810[1]	821	809
Business Failures (Dun & Bradstreet)	203	196	191
Currency in Circulation (millions)[3]	$30,810	$30,910	$30,401
Dept. Store Sales (changes from year ago)[3]	+4%	+4%	+4%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$24,237	$19,519	$22,785
Federal Gross Debt (billions)	$274.5	$275.4	$277.2
Bond Volume, NYSE (millions)	$18.3	$21.5	$23.0
Stocks Sales, NYSE (thousands of shares)	10,449	9,835	12,038
Loans and Investments (billions)[4]	$85.9	$85.7	$84.7
U. S. Govt. Obligations Held (billions)[4]	$26.5	$26.5	$30.9
PRICES			
STEEL's Finished Steel Price Index[5]	225.71	225.71	207.63
STEEL's Nonferrous Metal Price Index[6]	265.0	266.1	263.2
All Commodities[7]	115.1	115.1	111.4
Commodities Other Than Farm & Foods[7]	122.6	122.6	117.9

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1956, 2,461,893; 1955, 2,413,278. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100

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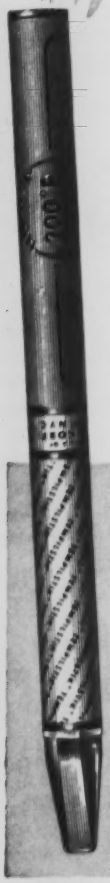

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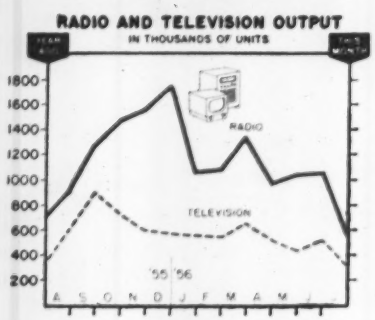
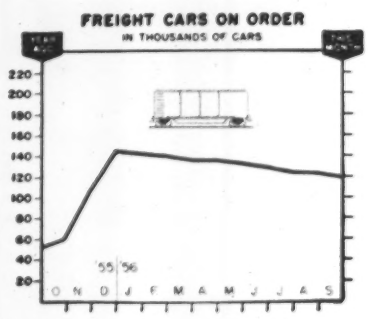
THE BUSINESS TREND





	Radio		Television	
	1956	1955	1956	1955
Jan.	1,079	1,068	588	655
Feb.	1,094	1,090	576	703
Mar.	1,360	1,482	680	831
Apr.	993	1,100	550	583
May	1,060	1,114	468	467
June	1,073	1,205	553	590
July	567	718	337	344
Aug.	....	948	...	848
Sept.	....	1,302	...	940
Oct.	....	1,500	...	760
Nov.	....	1,581	...	632
Dec.	....	1,786	...	605
Totals	....	14,895	...	7,757

Radio-Electronics-Television Mfrs. Assn.

	Awards		(end of month)	
	1956	1955	1956	1955
Jan.	1,818	5,087	144,946	18,395
Feb.	1,675	2,690	141,437	18,633
Mar.	1,618	2,156	137,070	17,974
Apr.	6,559	2,706	137,436	17,930
May	2,403	3,041	133,072	16,886
June	2,859	13,365	129,409	27,102
July	2,642	18,007	126,194	42,888
Aug.	2,575	13,405	122,870	52,803
Sept.	....	3,228	.....	52,913
Oct.	....	12,843	.....	61,954
Nov.	....	51,066	.....	109,370
Dec.	....	42,278	.....	147,320
Total	....	169,872		

American Railway Car Institute.

Charts copyright, 1956, STEEL.

above the housing activity in 1956. Few experts have been as optimistic, the consensus being closer to 1 million. But with plant expansion and road building reaching record levels next year, the overall outlook is unchanged.

Machine Tool Orders Up

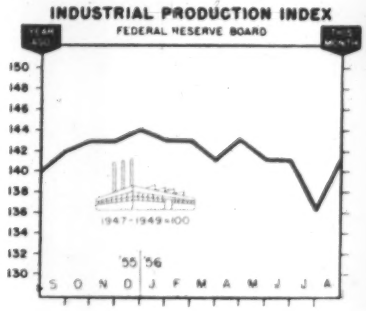
Current reports from industries in the "hard core" of metalworking leave little to be desired. The majority is looking for a record fourth quarter. Net new orders for machine tools totaled $87.45 million in August, the highest since March. Even though shipments worth $75.1 million fell short of orders, the backlog of the industry slipped from 7.8 months in July to 7.7 months in August. The National Machine Tool Builders' Association explains that the backlog is determined by the industry's ability to ship tools. Shipments are expected to rise now that vacation season is past, so the backlog is shrinking. The association still anticipates gross orders worth $1 billion this year (they're $702,950,000 through August) and shipments worth $900 million. Shipments through August totaled only $558,450,000, leaving a goal of nearly $342 million for the last four months of this year. That's an average of over $85 million a month, far better than anything demonstrated to date.

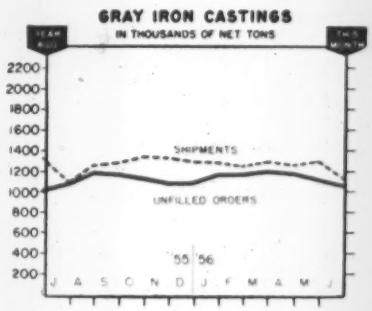
Indicative of the general tone of business confidence is the fact that cancellations in July and August fell below $5 million a month after averaging close to $6 million a month during the first half.

Appliance Outlook Good

Appliance sales and shipments are recovering from the vacation period and are headed up. Radio and television set production is still under that of the comparable period of 1955 (see chart, this page), but retail sales are running ahead of year-ago periods, says Radio-Electronics-Television Manufacturers Association. The deficit in radios this year is accounted for by lower auto demand.

Kawneer Co., Niles, Mich., reports that contracts with virtually all the nation's major manufacturers of refrigerators for next year's production of component parts have been closed. W. J. Woodruff, general manager of the Appliance Products Division, reports: "The slackening of activity that first be-





(Seasonally adjusted)

	Total Production		Primary Metals		Metal Fabricating	
	1956	1955	1956	1955	1956	1955
Jan.	143	132	148	127	170	157
Feb.	143	133	148	131	168	157
Mar.	141	135	145	136	166	160
Apr.	143	136	145	138	171	160
May	141	138	141	140	167	163
June	141	139	135	143	168	164
July	136	139	67	134	170	166
Aug.	141*	140	127*	139	174*	168
Sept.	...	142	...	146	...	171
Oct.	...	143	...	148	...	173
Nov.	...	143	...	149	...	172
Dec.	...	144	...	151	...	172
Avg.	...	138	...	140	...	165

Federal Reserve Board. *Preliminary.

	Shipments		Unfilled Orders*	
	1956	1955	1956	1955
Jan.	1,250	1,092	1,158	782
Feb.	1,215	1,106	1,141	852
Mar.	1,255	1,315	1,163	842
Apr.	1,218	1,294	1,145	966
May	1,236	1,310	1,086	938
June	1,152	1,296	1,041	982
July	....	1,070	....	1,050
Aug.	....	1,226	....	1,160
Sept.	....	1,253	....	1,151
Oct.	....	1,310	....	1,113
Nov.	....	1,306	....	1,062
Dec.	....	1,260	....	1,075
Total	....	14,838		

*For sale. U.S. Bureau of the Census.

came evident in June and which has continued until now will be overcome, and we believe the 1957 appliance model year will be a satisfactory period."

Harold Bull, vice president of distribution for the Norge Division, Borg-Warner Corp., says that by 1960, more than 74,000 major home appliances will be sold every day, an increase of 41 per cent over the present volume. He feels that the number of appliance dealers will increase by 10 per cent within four years.

Car Deliveries Steady

Deliveries of freight cars to the nation's railroads are holding at a practically constant level of about 5350 cars a month, indicating that the industry is at its practical capacity. Deliveries of plate and structural shapes prevent carbuilders from stepping up the pace. If awards (about 2500 a month) and production continue at this pace, the industry has a backlog that will carry it for more than three years (see chart on page 132).

Railroads also installed 127 new locomotives during August, up seven units from June. In the first eight months, they received 1032 locomotives, compared with only 701 in the same period last year. The backlog is now 739 units, 35 units better than on Sept. 1, 1955.

Market Memos

- Industrial Heating Equipment Association reports orders worth $6,721,789 for August, compared with $6,273,053 for August, 1955. Orders in the first eight months of this year are 48 per cent ahead of the year-ago period.
- Business failures and incorporations are still running well ahead of the 1955 rate, reports Dun & Bradstreet Inc. Figures through August of this year and last show: Failures, 8615 vs. 7375; incorporations, 99,109 vs. 96,233. August was a record month for both categories.
- The cost of living dropped from 117 in July to 116.8 in August (1947-49=100), reports the Bureau of Labor Statistics. At the same time, factory workers' take-home pay reached an all-time high. This means that more money will buy more things. The bureau says the actual purchasing power of today's wages is about 2 per cent higher than it was a year ago.

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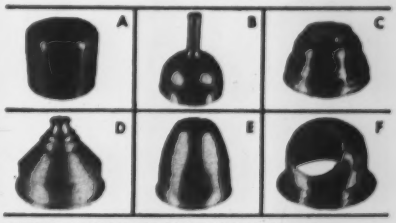
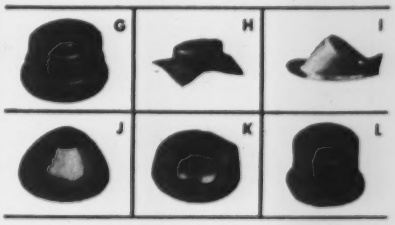


METAL SPINNING AND SPINFORMING:
Typical items: A—Aircraft detail; B—Handle lamp; C—Lamp shade; D—Lamp base; E—Electronic cover; F—Compass cover.



HYDROFORMING:
Typical items: G—Appliance cover; H—Jet engine detail; I—Aircraft detail; J—Jet engine detail; K—Cleaner cover; L—Motor housing.

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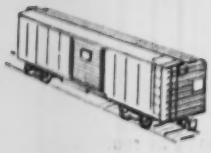

A new Lading Strap Anchor developed by the Pullman-Standard Car Mfg. Co., Chicago, is attached to guide plates by Tinnerman SPEED GRIP Nut Retainers. This anchor now makes it possible for shippers to fasten heavy loads in box cars without nailing or shoring. SPEED GRIPS were selected to make these heavy-duty attachments because no other fastener offers so many advantages for blind-location assembly.

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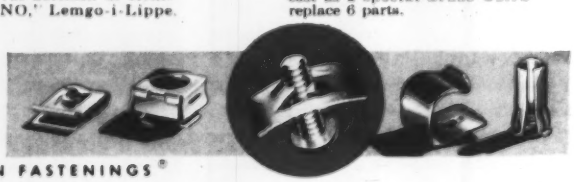
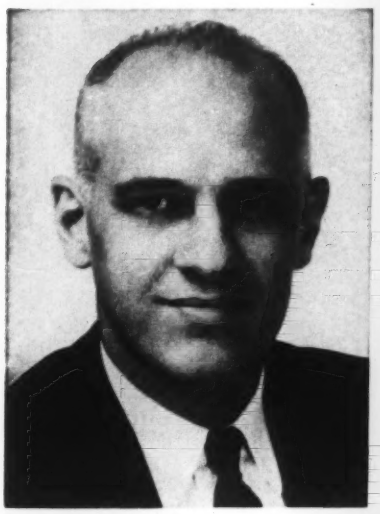




FREDERICK A. FIELDER
. . . gen. sales mgr., Loewy-Hydropress

Frederick A. Fielder was made general sales manager, **Loewy-Hydropress Division,** Baldwin-Lima-Hamilton Corp., New York.

William E. Cranston was elected president and **Howard N. Kyser,** vice president and general manager of **A. J. Lindemann & Hoverson Co.,** Milwaukee, subsidiary of Norris-Thermador Corp. **Eugene A. Lindemann,** former president and general manager, resigned to establish a business management consulting firm. Mr. Cranston was a co-founder (1932) of Thermador Electrical Mfg. Co., Los Angeles. He retains his positions as president of Thermador and first vice president of Norris-Thermador. Mr. Kyser was general manager of Studebaker Corp.'s Los Angeles plant.

S. C. Censky was named purchasing agent for the Milwaukee division of **Cherry-Burrell Corp.** He succeeds **T. J. Millon,** made purchasing manager at Chicago.

H. L. Schrock Jr. was elected vice president-general manager, ball and bearing division, **Hoover Ball & Bearing Co.** and subsidiaries, Ann Arbor, Mich.

George L. Barton was made manager of special product sales for **Greist Mfg. Co.,** New Haven, Conn. A consulting engineer, he has been president of Barton Service Corp.

W. R. HUGUENIN
. . . Hudson-Sharp Machine president

Food Machinery & Chemical Corp. elected **W. R. Huguenin** president of its newly acquired Hudson-Sharp Machine Co., Green Bay, Wis., to succeed **Samuel J. Campbell,** retired. Mr. Huguenin is in charge of FMC's Stokes & Smith Co., Philadelphia, and supervises activities of its other packaging machinery operations at Simplex Packaging Machinery Division, Oakland, Calif., and Kingsbury & Davis Machine Division, Contoocook, N. H. **Arthur J. Olsen** was made resident manager at Hudson-Sharp and is replaced as resident manager at Simplex by **George Jones.**

John R. Mazza was made manager of manufacturing at **Bart-Messing Corp.,** Belleville, N. J. He was chief engineer.

Malcolm A. Jones was made plant engineer at Fontana, Calif., for **Kaiser Steel Corp.** He was assistant chief engineer, Lackawanna plant, Bethlehem Steel Co.

Albert W. Rohde was made director of purchasing at **Crown Cork & Seal Co. Inc.,** Baltimore. He was purchasing manager in the can division.

Karl D. Swartzel was made chief research and development engineer, guided missiles division, **Republic Aviation Corp.,** Farmingdale, L. I.

WILBUR H. PETER JR.
. . . heads Electric Controller Div.

Wilbur H. Peter Jr. was elected a vice president of **Square D Co.,** Detroit, and division manager of the **Electric Controller Division,** Cleveland. Previously works manager of the division, Mr. Peter succeeds **Alvin C. Dyer** who retires as vice president and division manager but continues with Square D as a consultant on application of the firm's electrical controls to steel mill and related heavy industry operations.

Carra L. Lane was elected president of Security Engineering Division, **Dresser Industries,** Dallas. He succeeds **Ott Hammer,** promoted to a vice presidency of Dresser. Mr. Lane was vice president-general manager, Walker-Turner Division, Kearney & Trecker Corp.

Earle C. Smith was appointed director of research, **Republic Steel Corp.,** Cleveland. He continues as chief metallurgist. Mr. Smith will supervise a new research laboratory soon to be constructed in Independence, O.

Barney L. Keywell was elected president of **Samuel G. Keywell Co.,** Detroit. **Samuel G. Keywell** is now chairman.

In the quality control department of **Weirton Steel Co.,** Weirton, W. Va., **M. H. Kessler** was made assistant vice president; **G. F. Buckle,** manager-service and in-

LESTER N. DUKELOW
. . . div. sales mgr. for Republic

HARRY E. PATTERSON JR.
. . . Precision Mfg. purchasing agent

FULTON R. MAGILL
. . . heads Rockwell's standardization

spection; **S. J. Dougherty**, chief metallurgist; and **C. J. Vincent**, assistant manager-service and inspection.

Lester N. Dukelow was made sales manager, high strength steel division, **Republic Steel Corp.**, Cleveland. He was special representative in the alloy sales division of Jones & Laughlin Steel Corp.

Kellett Aircraft Corp., Camden, N. J., appointed **Leonard Goland** director of research; **Al Yackle**, chief of special projects.

M. E. Dorman was made manager of dealer and accessory sales for the die supply division, **E. W. Bliss Co.**, Cleveland. He has served Bliss for 16 years.

W. J. Klein was appointed vice president and director of sales and **W. L. Voegeli**, general sales manager, Tractor Group, **Allis-Chalmers Mfg. Co.**, Milwaukee.

Marvin C. Bonine, former plant manager for Yale & Towne Mfg. Co.'s lock and hardware plant, Salem, Va., was appointed manufacturing manager, **Pacific Switchgear Division**, Federal Pacific Electric Co., San Francisco.

Shell Process Inc., West Springfield, Mass., appointed **Malcolm Petrie** assistant sales manager.

George Karian was appointed manager, tabletting division, **F. J. Stokes Corp.**, Philadelphia.

Harry E. Patterson Jr. was made purchasing agent for **Precision Mfg. Co. Inc.**, Dover, N. J. He held a similar post with Ronson Corp.

George B. Howell was made sales manager, tubular products and cold finished steel bars at the Detroit plant of **Joseph T. Ryerson & Son Inc.** He resigned as purchasing agent of Autocar Co.

Paul K. Dubin was made general works manager, **Ulbrich Stainless Steels Inc.**, Wallingford, Conn.

Rockwell Mfg. Co.'s meter and valve division appointed **W. M. Connor** assistant to the vice president at Pittsburgh. He is succeeded as general manager of the DuBois gas meter plant by **Earl Hudson** who in January was named general manager of the Porterville, Calif., plant. **A. A. Fomilyant**, general manager of the Tulsa, Okla., plant, will assume the general managership of the Porterville plant when it is completed early next year.

Ellison L. Wefel resigned as vice president, **Lombard Corp.**, Youngstown, to establish a consulting service for the metal extrusion industry, specializing in problems of oil hydraulic equipment.

Kirby F. Thornton was made assistant manager of **Aluminum Co. of America's** New Kensington, Pa., sales development division. He was division chief engineer.

Rockwell Mfg. Co., Pittsburgh, expanded its standardization program to include all divisions of the company. **Fulton R. Magill**, standards engineer, Delta Power Tool Division, will head the new unit. At Delta, **Byron E. Coon**, manager of sales promotion and merchandising, was named general sales manager; and **Irving G. Meyer**, an assistant to the vice president, was named sales manager and product manager, Delta Homecraft.

R. D. Jones was made general sales manager of **Automatic Transportation Co.**, Chicago. He succeeds **George A. Hinckley**, now manager of Automatic's New York sales and service branch which he formerly served as sales manager. **Philip E. Whiting**, former branch manager, continues as sales adviser until retirement.

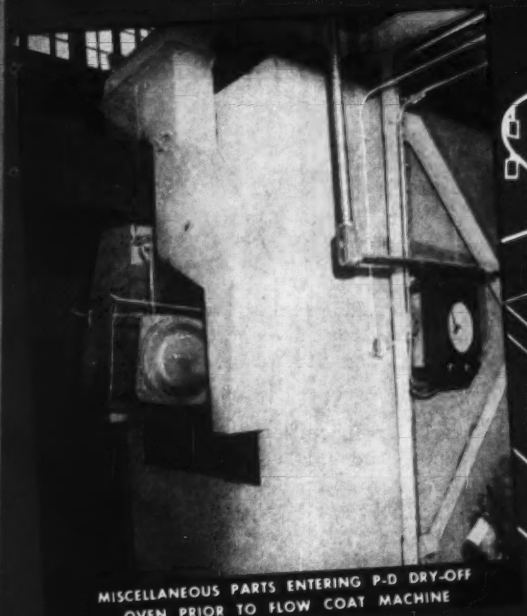
I. R. Leheney was made Cleveland district sales manager, **Allegheny Ludlum Steel Corp.** He succeeds **W. R. Kuhn**, effective Jan. 1.

George M. Hartley, sales manager of **General Electric Co.'s** chemical materials department, Schenectady, N. Y., was appointed manager of marketing for the metallurgical products department, Detroit. He succeeds **J. E. Weldy**, recently made a marketing consultant, marketing services division, New York. **Curt W. Cuno** was named plant engineer, semiconductor products department, Syracuse, N. Y. **George F. Young**

CROSSROADS OF PRODUCTION MEET IN A 60 FT. SQUARE

5-Stage Power Spray Phosphatizing System with Flow Coat Painting and Roof-Top Baking Ovens

by PETERS-DALTON



MISCELLANEOUS PARTS ENTERING P-D DRY-OFF OVEN PRIOR TO FLOW COAT MACHINE

MISCELLANEOUS PARTS ENTERING P-D 5-STAGE PHOSPHATIZING MACHINE

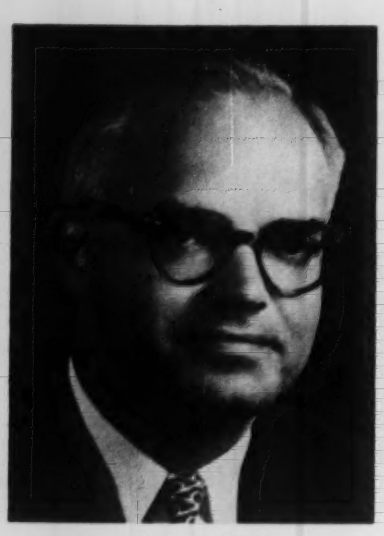
Here in this divisional plant of a major appliance manufacturer, a carefully chosen location with economy of space for finishing operations was most necessary. Although the building has a huge one floor area, the many fabricating and assembling operations are space consuming. To co-ordinate these phases with finishing operations required detailed study and design by Peters-Dalton engineers. Results: A Complete Set-Up — 5-Stage Power Spray Phosphatizing System, Flow Coat Painting, and Roof-Top Baking Ovens—all installed in an area 60' x 60' square. Conveyor units carry parts of various sizes through these operations continuously and deliver them completely finished to the final assembly stations.

These compact, efficient units — designed, fabricated and installed by Peters-Dalton — include a 5-Stage Power Spray Phosphatizing System with: Stage 1, Wash at 180° — Stage 2, Rinse at 180° — Stage 3, Phosphatizing at 160° to 180° — Stage 4, Cold Rinse — Stage 5, Chromic Acid Rinse at 140° — temperatures are maintained with gas fired P-D vertical heaters. The low pressure Flow Coat Painting is at 100 g.p.m., with viscosity control and solvent flush system. The Roof-Top Baking Ovens are heated by direct fired gas heaters with set cycles; dry-off of 300° for 4 minutes; prime bake at 450° for 15 minutes; white enamel at 400° for 30 minutes. The system handles miscellaneous metal parts at conveyor speeds of 6 ft. per minute, with a weight capacity of 9M lbs. per hour. As in all Peters-Dalton installations, pumps of adequate capacity, correctly sized piping and spray nozzles, drain separations, exhaust ventilation, etc. etc., have been most carefully engineered and installed to meet all requirements.

Whether your needs are for small or large equipment, depend with confidence upon Peters-Dalton. Just write, wire or phone — we'll be glad to tell you more.

- *Hydro-Whirl Paint Spray Booths*
- *Industrial Washing Equipment*
- *Drying and Baking Ovens*
- *Hydro-Whirl Dust Collecting Systems*

PD Peters-Dalton INC.



PAUL W. PHENEGER
. . . Pollak Steel administrative v. p.

RALPH C. REINHART
. . . Baker-Raulang mfg. director

PHILLIP DELMER
. . . Clearing Machine hydraulic sales mgr.

was made superintendent, power transformer and heavy tank fabrication, power transformer department, Pittsfield, Mass.

Paul W. Pheneger was made administrative vice president, **Pollak Steel Co.**, Cincinnati. He was general superintendent at Superior Steel Corp.

William C. Stratton was made chief engineer, engineering and construction department, **Dravo Corp.**, Pittsburgh. **A. A. Nilsen** was made manager of the department's ore agglomeration.

Roger Byrnes was made midwestern district manager for **Adamas Carbide Corp.**, Chicago.

Cam Morawski was appointed to the sales engineering staff of **Detroit Broach & Machine Co.**, Rochester, Mich. Formerly in charge of broach engineering, he is succeeded by **Stanley Staton.**

James P. Malmstrom, director of operations, was elected a vice president of **United Aircraft Products Inc.**, Dayton, O.

Ralph C. Reinhart was named director of manufacturing by **Baker-Raulang Co.**, Cleveland. **Robert J. Laws** was named assistant chief engineer. Mr. Reinhart has served Otis Elevator Co., the parent firm, for 25 years; his last position was director of operations research.

Charles C. Hall was made general sales manager, **United Steel Fabricators Inc.**, Wooster, O. He was sales manager, highway products division.

Robert L. Kline was made general sales manager, **Breuer Electric Mfg. Co.**, Chicago. He was regional sales manager for the West Coast and the western provinces of Canada. New regional sales manager for the West Coast is **Frank Young,** formerly with Richter Engineering Co., Los Angeles.

Harold H. Gillespie, Emil J. Karkut and **Raymond S. Mann** were made vice presidents, **Barden Corp.**, Danbury, Conn. Mr. Gillespie is vice president-assistant general manager; Mr. Karkut, vice president-factory manager; Mr. Mann, vice president-personnel director.

Phillip Delmer was made manager of hydraulic press sales, **Clearing Machine Corp.**, division of U.S. Industries Inc. at Chicago.

John P. Beal Jr., former assistant works manager, Titusville, Pa., plant, Universal - Cyclops Steel Corp., was named production manager, **Cyclops Division,** Bridgeville, Pa.

Truscon Steel Division, Republic Steel Corp., Youngstown, appointed **E. H. Nichols** manager of sales, industrial products, to succeed **Walter C. Conger** who was made manager of sales of its new special projects department. **J. D. Kirkwood** was made manager of sales, steel joist and tower products.

Fayette R. Plumb Inc., Philadelphia, appointed **Joseph W. Mackenzie** special assistant to the president. He previously served as manager of special products sales of Weatherhead Co.

Globe-Union Inc., Milwaukee, appointed **Ronald M. Fiandt** to the new post of director of automotive product design and development.

OBITUARIES . . .

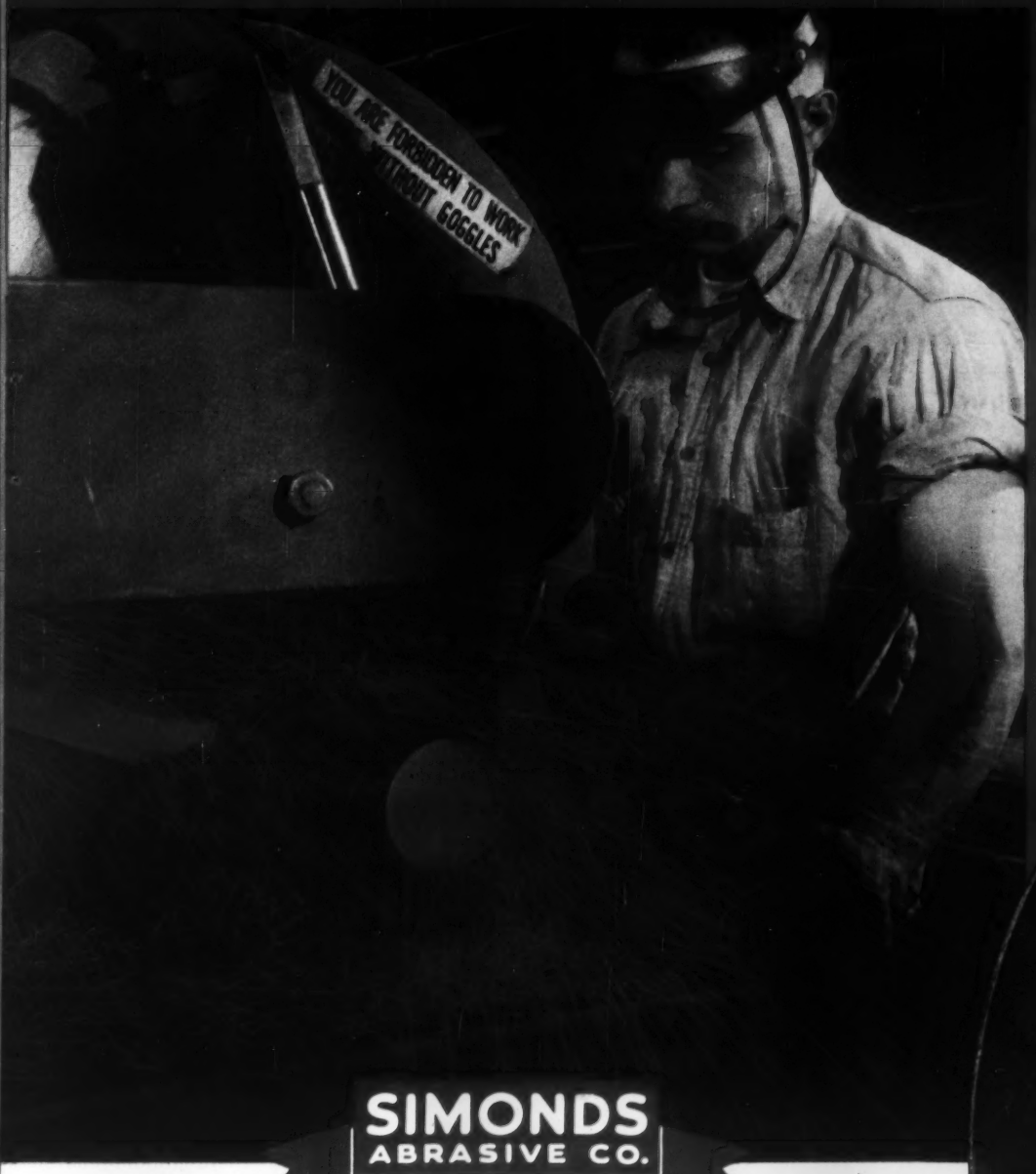
Joseph W. C. Bullard Sr., 74, former vice president, **Bullard Co.**, Bridgeport, Conn., died Sept. 16.

Percy Ford-Smith, founder of **Ford-Smith Machine Co. Ltd.** at Hamilton, Ont., died Sept. 14.

Edwin B. Meissner, 71, president, **St. Louis Car Co.**, St. Louis, died Sept. 10.

William C. Safford, 50, assistant division superintendent, hot and cold strip mill, Midland, Pa., Works of **Crucible Steel Co. of America,** died Sept. 10.

F. W. Marshall, 74, head of **F. W. Marshall & Co.**, sales representative of merchant pig iron producers, died Aug. 31 in Chatham, Mass.



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These thin, fast-cutting, resinoid-bonded wheels slice through the hardest-to-cut materials in seconds, giving more cuts per wheel — less stock waste — and essential accuracy in cutting lengths to close tolerances. They often eliminate finishing, too, since the ends they produce are smooth. Operating speeds from 10,000 to 12,000 s.f.p.m. (16,000 s.f.p.m. on specially designed machines.) Write for bulletin ESA-163 and name of distributor.

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The superior toughness and uniformity of KX-99 in hot metal car and hot metal mixer linings has provided such outstanding service records, many leading steel companies have standardized on their use.

The exceptional properties of KX-99 brick enable them to better withstand erosion and slag action. Uniformity of size permits laying up KX-99 with very thin joints to better withstand the scouring and washing action of molten metal.

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Porter Buys Firm

West Virginia Steel & Mfg. Co.'s operations will be combined with those of Connors Steel

H. K. PORTER Company Inc.'s Connors Steel Division, Birmingham, acquired West Virginia Steel & Mfg. Co., Huntington, W. Va. Transfer of ownership was made effective Oct. 1.

Operations of the newly acquired plant will be combined with those of Connors Steel, says B. Campbell Blake, vice president and general manager of Connors. Many of the products of the two plants are similar, including light steel rails, reinforcing bars, mine roof bolts, hot-rolled bars and semifinished steel.

Boosts Capacity — Porter purchased Connors Steel in 1949 and recently completed a multimillion dollar expansion, increasing capacity by 15 per cent and adding new products, including cold-finished bars. Plans are being made to expand West Virginia Steel's operations.

As of Jan. 1, 1956, Connors was operating three electric furnaces with an annual capacity of 115,000 net tons. Rated capacity of West Virginia Steel's one electric furnace was 78,840 tons at that time.

J. J. Durkin, West Virginia Steel's executive vice president, will continue to supervise operations at Huntington.

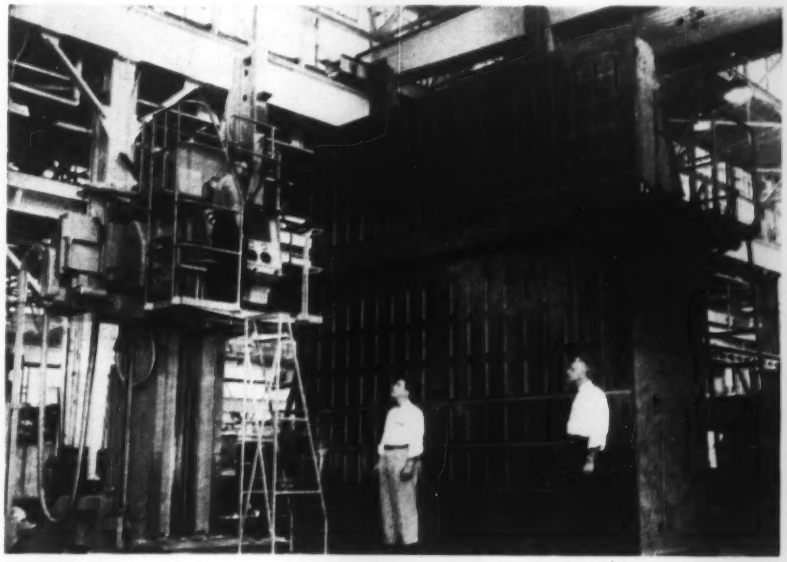
Kwikset Installs Furnace

Kwikset Locks Inc., Anaheim, Calif., has installed a high temperature, atmosphere controlled furnace capable of reaching 3100°F. The company claims the furnace is the first of its type in Southern California.

DeVilbiss Moves Branch

DeVilbiss Co., Toledo, is moving its direct factory branch in Dallas to larger quarters in the Trinity Industrial district on Irving boulevard, that city. DeVilbiss makes spray guns, booths, air compressors, rubber hose and other

(*Please turn to page* 144)



Aircraft Firm To Get Huge Keller Milling Machine

This 75-ton automatic tracer-controlled machine will be used to mill forgings for jet powered aircraft at Douglas Aircraft Co., Santa Monica, Calif. Manufactured by Pratt & Whitney Co., West Hartford, Conn., it has a horizontal travel of 14 ft and a vertical travel of 7 ft. The machine's fixture, fabricated by Avery & Saul, Cambridge, Mass., weighs about 30 tons. It is 14 ft wide and stands 16 ft high above the machine table. Front plate of the lower fixture is 3 in. thick. Vertical slots were torch-cut requiring no further machining

the ONLY PORTABLE NIBBLER *that* CUTS 10 Gauge Steel

Model HN for 10 gauge Stainless Steel and 8 gauge Mild Steel. 6" radius.

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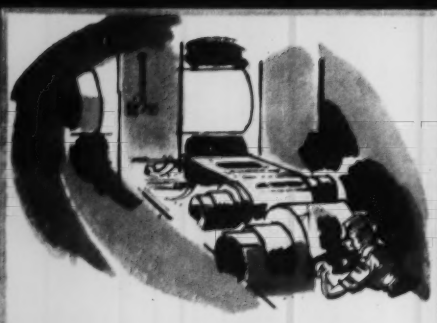
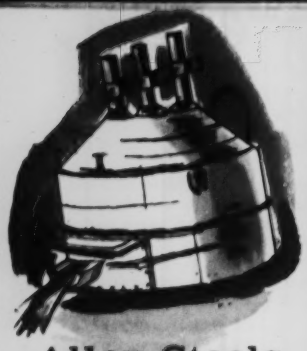


Stainless Steels

A pioneer and prime supplier of Stainless to the automotive, appliance and general fabrication industries, Sharon is one of the most experienced producers of this metal in the nation today. Sharon makes a complete line of chrome, chrome-nickel and special grades including the new 200 series.

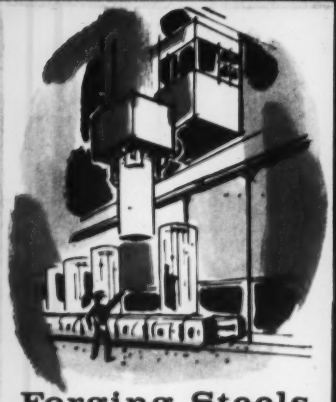
Lo-Alloy Hi-Strength Steels

In Lo-Alloy Hi-Strength Steels Sharon offers users a choice of two of the finest — Sharon Cor-Ten® and Sharon N-A-X® — plus other grades for particular requirements. Such products as earth moving machine frames, truck and bus frames, boiler tubes, bumpers, petroleum and gas pipe lines, transmission parts, brake shoes are currently being made from these steels. Available in heavy plate, hot and cold rolled strip in coils or cut lengths.



Alloy Steels

Sharon has long been a leading source for special alloy steels compounded to meet specific requirements. Many such alloys have been made to achieve added strength or to provide greater heat and corrosion resistance.



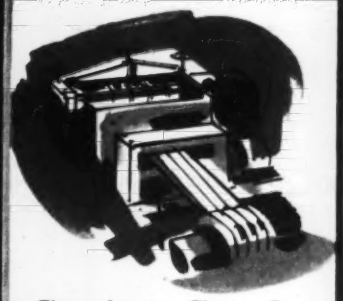
Forging Steels

Sharon Forging Ingots, Blooms and Billets are available in carbon, alloy, stainless and special analysis steels in a wide range of sizes.

Strapping Steels

Strapping steel is available in black painted and galvanized finishes in a complete range of sizes from ⅜" x .010 to 2" x .065 with the tools, accessories, seals, nails, corner protectors, staples, anchor plates, etc. as required.

Here's the Sharon Family of quality metals!

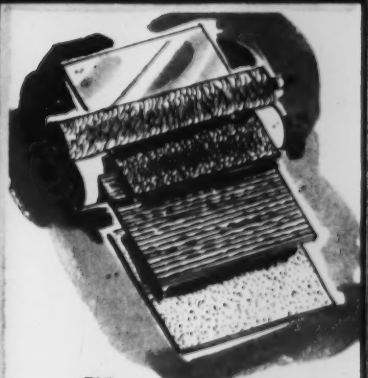


Spring Steels

Sharon has a complete line of high carbon, cold rolled alloy and plain steels with S.A.E. designation of 1025 or above with excellent application reputation. Typical uses are cutlery, fasteners, clamps, chains, clips, saws, etc.

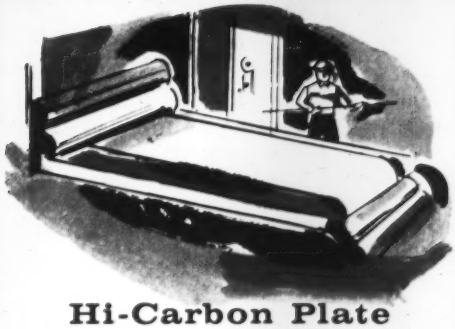
Coated Steels

Sharon Galvanite® is one of the finest hot dip zinc coated steels available to manufacturers today. Tightly bonded, it has a "matte" surface to which enamels adhere exceedingly well. Sharon also rolls top quality terne, a bright surface hot dip and electro galvanized steel.



Sharonart

Rolled-in surface pattern steel, exclusive with Sharon, enables manufacturers to change product style without changing dies. Available in a wide variety of standard patterns, or specials where required. Typical products include hardware, automotive trim, machine cases, radio and TV cases and trim.



Hi-Carbon Plate

One of the few sources of supply for quality high carbon plates in the full S.A.E. range from 1010 to 1090 for such appliances as structural plates, railroad equipment, road working machinery, scraper blades, farm equipment, etc.

Titanium

Mallory-Sharon has for the past few years been providing industry with titanium in many grades in hot rolled sheet, hot and cold rolled strip, rods, bars, billets, wire coil and plates.

Here you see a gallery consisting of the more prominent members of the Sharon family of metals. Brought into existence more than half a century ago, this family has steadily grown and prospered to become recognized throughout the automotive, appliance and general metal fabricating industries for unsurpassed dependability and quality at its finest.

SHARONSTEEL

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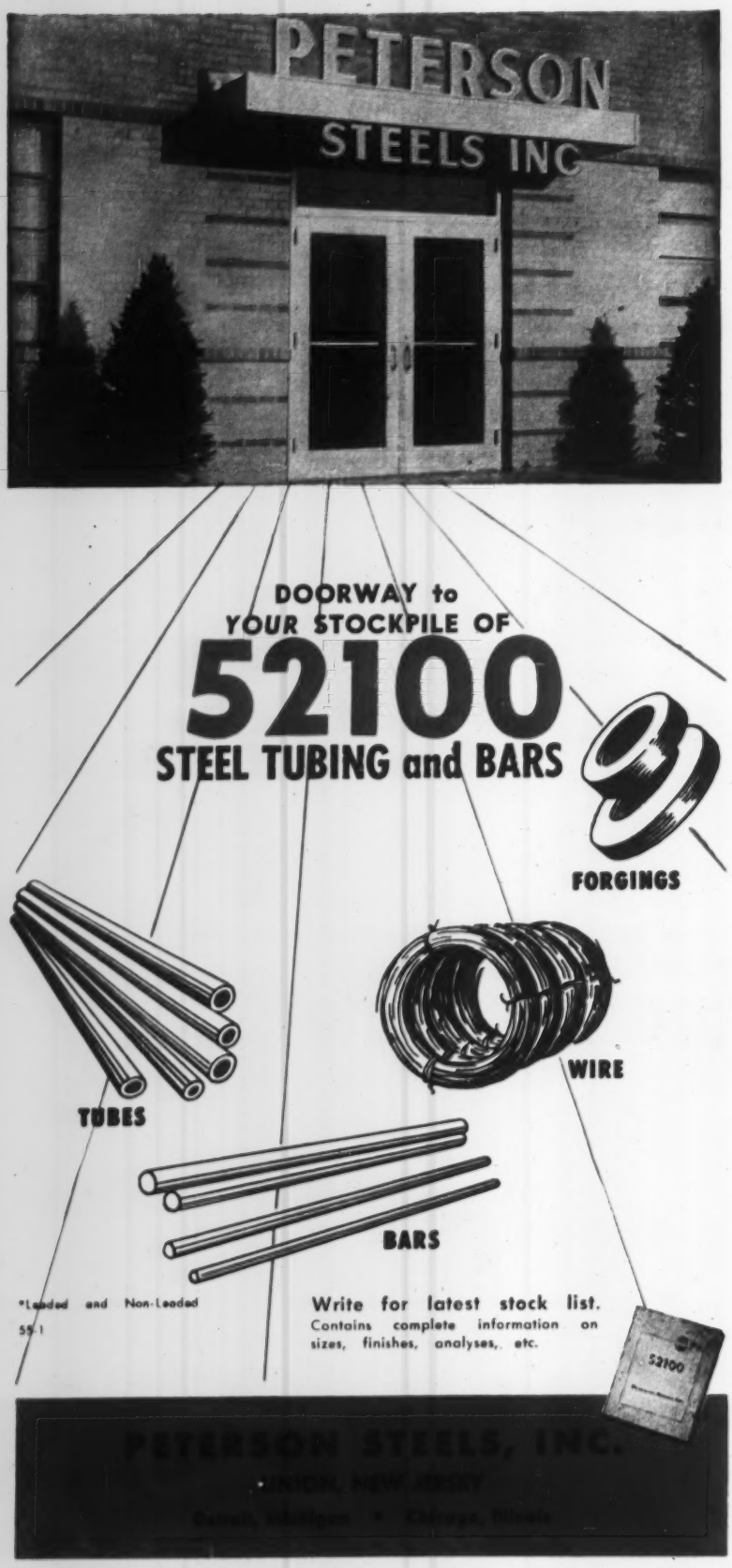
Sharon, Pennsylvania

DISTRICT SALES OFFICES: Chicago, Cincinnati, Cleveland, Dayton, Detroit, Grand Rapids, Indianapolis, Los Angeles, Milwaukee, New York, Philadelphia, Rochester, San Francisco, Seattle, Montreal, Que., Toronto, Ont.



(*Concluded from page* 141)

components for complete finishing systems.

Norton Forms New Divisions

Norton Co., Worcester, Mass., created three new divisions: Abrasive, John Jeppson, general manager; Refractories, W. G. Fallon, general manager; and Electro-Chemical, headed by H. J. Daly as vice president and general manager.

Ralph M. Johnson, formerly vice president in charge of sales of abrasive and refractory products, becomes vice president and director of sales. Mr. Jeppson also becomes vice president and director of manufacturing.

Fullerton Opens Warehouse

Fullerton Steel & Wire Co., Chicago, opened a warehouse in Milwaukee to be known as Fullerton Metals of Wisconsin Inc. It will carry stocks of aluminum, brass, steel, magnesium, copper, stainless steel and other metals and alloys. D. F. Manning is general manager of this facility.

Offers Phillips Head Screws

United Screw & Bolt Corp. has been licensed to manufacture Phillips head screws and Sems washer assemblies. United operates plants in Chicago and Cleveland.

Bailey Meter Expands Plant

Bailey Meter Co., Cleveland, is building a 72,000-sq-ft addition to the 165,000-sq-ft unit completed last year at its Wickliffe, O., plant. The firm makes instruments and automatic controls for the power and process industries.

Opens Auto Equipment Plant

Monroe Auto Equipment Co., Monroe, Mich., dedicated its $2.5-million, automotive part plant at Hartwell, Ga.

Canadian Steel Foundries Ltd.

A new company, Canadian Steel Foundries Ltd., will take over the facilities of the Steel Foundry Division of Canadian Car & Foundry Co. Ltd., Montreal, Que., and oper-

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There is no better protection for STEEL against corrosion than HERESITE. Twenty two years experience in development of protective coating for iron and steel are the guarantee for quality products.

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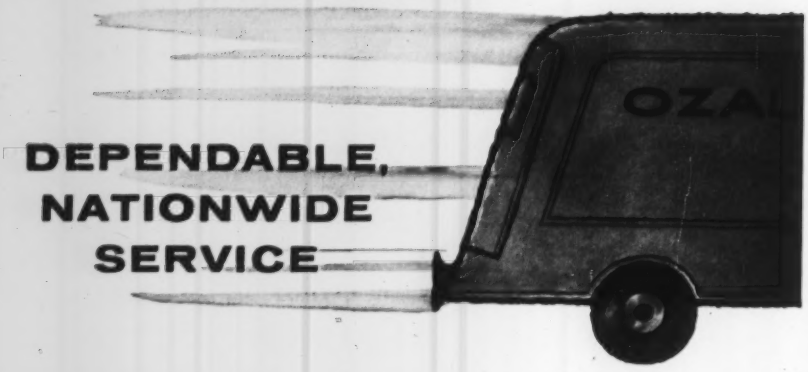

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You're assured *many more years* of continuous, trouble-free printmaking in *two important ways*—when you buy an Ozalid whiteprinter.

First: the model you choose is the finest performer in its class—rugged in design, reliable in operation.

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More than 250 factory-trained service experts across the country keep your Ozalid machine in top trim. Their "preventive maintenance" program—including inspection, cleaning, lubrication—avoids service calls and jam-ups for you.

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In Canada: Hughes Owens Company, Ltd., Montreal

NEW "STREAMLINER 400"

LOOK FOR IT!

ate them as a separate entity. The new company will be a corporate member of the A. V. Roe Canada Ltd. group.

Georgia To Get Mica Plant

A new concern, Mica & Minerals Corp. of America, plans construction of a mica processing plant in Hart county, Georgia. Headquarters for the firm will be at Hartwell, Ga. Plant investment will be more than $300,000.

Raymond Rosen Firm Renamed

Raymond Rosen Engineering Products Inc., Philadelphia, changed its name to Tele-Dynamics Inc. The firm designs, develops and produces communication and telemetry equipment.

Will Build Near Buffalo

American Radiator & Standard Sanitary Corp.'s Ross Heat Exchanger Division, Buffalo, will build a plant next year in Cheektowaga, N. Y. The initial unit will cover about 50,000 sq ft.

Metal Finisher Opens Plant

Crown City Plating Co., Pasadena, Calif., opened a new plant in El Monte, Calif., to triple its metal finishing capacity.

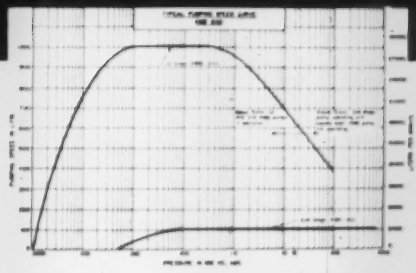
Wagner Mfg. Changes Name

Wagner Mfg. Co. Inc., Jackson, Mo., manufacturer of welding accessories, changed its name to Lenco Inc.

Vanadium Corp. Moves Unit

Vanadium Corp. of America, New York, transferred its engineering department to new facilities at Cambridge, O. Moving the department from the operating plant at Niagara Falls, N. Y., to the new location is designed to centralize all engineering and development work in the corporation's new Research Center. Service to its operating plants at Cambridge and Graham, W. Va., and the new plant now under construction in Jefferson county, Ohio, will be improved. H. C. Parkman, assistant vice president-operations, has tempor-

WHEN THE HEAT IS ON . . .
IN VACUUM METALLURGY INSTALLATIONS . . .



Kinney® HIGH VACUUM PUMPS PROVIDE DEPENDABLE, TROUBLE-FREE SERVICE!

Metallurgical vacuum processing becomes increasingly important as industry recognizes the great potential of vacuum-processed metals and alloys. The economical production of these metals depends upon the judicious selection of the vacuum equipment which must remove the gaseous impurities from the molten metal. The Kinney Model KMB-1200 Two Stage Mechanical Booster Vacuum Pump is typical of the multi-feature units we offer to make your vacuum melting operation more profitable. Check specification data to see why your process deserves a performance-proved Kinney pump!

For complete technical data and performance curves on this Model KMB-1200, KDH-130 Mechanical Booster Vacuum Pump, request Catalog No. 400 or contact one of our competently staffed district offices in Baltimore, Charleston, W. Va., Charlotte, N. C., Chicago (La Grange), Cleveland, Detroit, Houston, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis . . . or The International Sales Office, 90 West St., New York 6, N. Y.

SPECIFICATION DATA
Model KMB-1200 Two Stage
Mechanical Booster Vacuum Pump

Ultimate Pressure (McLeod Gauge)	0.1 Micron
Free Air Displacement	1230 CFM
RPM	1800/250
Motor H.P.	10 and 5
Oil Capacity	6 Gal.
Cooling	Water
Shaft Seal	Mechanical
Shaft Diameter	1½" and 1⅛"
Inlet Connection	8" Flanged
Outlet Connection	2" Screwed
Separator Tank	Kinney Swirl
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FORWARD DUMP BARROWS for FOUNDRIES

No. 102-A Barrow. Single steel wheel with 2" face, 16" diameter and 12 spokes.

No. 113-A Barrow. Two steel wheels with 2" face, 18" diameter and 10 spokes.

Here are two well-balanced charging Wheelbarrows for heavy duty foundry service. Handle loads up to 1000 lbs. Sturdy, welded, all-steel construction. Single wheel or double wheel. Available with zero pressure cushion type wheels or 4 ply pneumatic tired wheels with roller bearings. Immediate shipment.

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Sterling FOUNDRY EQUIPMENT

STERLING WHEELBARROW COMPANY • MILWAUKEE 14, WIS., U.S.A.

A 5792-¾

arily assumed charge of engineering.

Sylvania Buys Assembly Plant

The Ruel H. Smith Enterprises plant in Titusville, Pa., has been purchased by the Parts Division, Sylvania Electric Products Inc., New York. It has been operating on a subcontract (assembling electronic components) from Sylvania for the last six years.

ASSOCIATIONS

Market promotion activities of the **National Coal Association,** Washington, have been transferred to its affiliate, the **Bituminous Coal Institute.** Officers of the institute include: R. L. Ireland, Pittsburgh Consolidation Coal Co., president, and Tom Pickett, National Coal Association, vice president.

Malleable Research & Development Foundation has been organized to promote technical progress in the foundry industry. Organizers are: Albion Malleable Iron Co., Albion, Mich.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Dayton Malleable Iron Co., Dayton, O.; National Malleable & Steel Castings Co., Cleveland; Wagner Malleable Iron Co., Decatur, Ill. Membership is open to other malleable foundries. Officers will include a president who will be the technical director and full-time executive officer.

NEW ADDRESSES

Circuit Instruments Inc., a subsidiary of International Resistance Co., moved to an enlarged plant at 2801 Anvil St., North St. Petersburg, Fla.

Beckman Instruments Inc.'s Helipot Division, moved to temporary quarters in Costa Mesa, Calif., preparatory to the occupation of a $2-million plant in Newport Beach, Calif., early next year. The move consolidates 16 Helipot facilities which were in South Pasadena, Pasadena, Alhambra

(Please turn to page 152)

CLAMP DOWN-

on excess inventory in your Annealing Department

● If you are caught in a "squeeze" for additional operating capital, you might look to your annealing department and ask yourself this question—"Do we have too much money tied up in process inventory?"

If you are operating old style multiple-stack furnaces, your process inventory is running from 50 to 80 per cent higher than the requirements of a single stack installation. A recent study proves that a complete installation of Lee Wilson single stack furnaces can "clamp down" on funds required for process inventory by several hundred thousand dollars.

Let a Lee Wilson sales engineer prove this to you at your convenience.

42

Lee Wilson® ENGINEERING COMPANY, INC.

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SINGLE-STACK RADIANT TUBE ANNEALING FURNACES

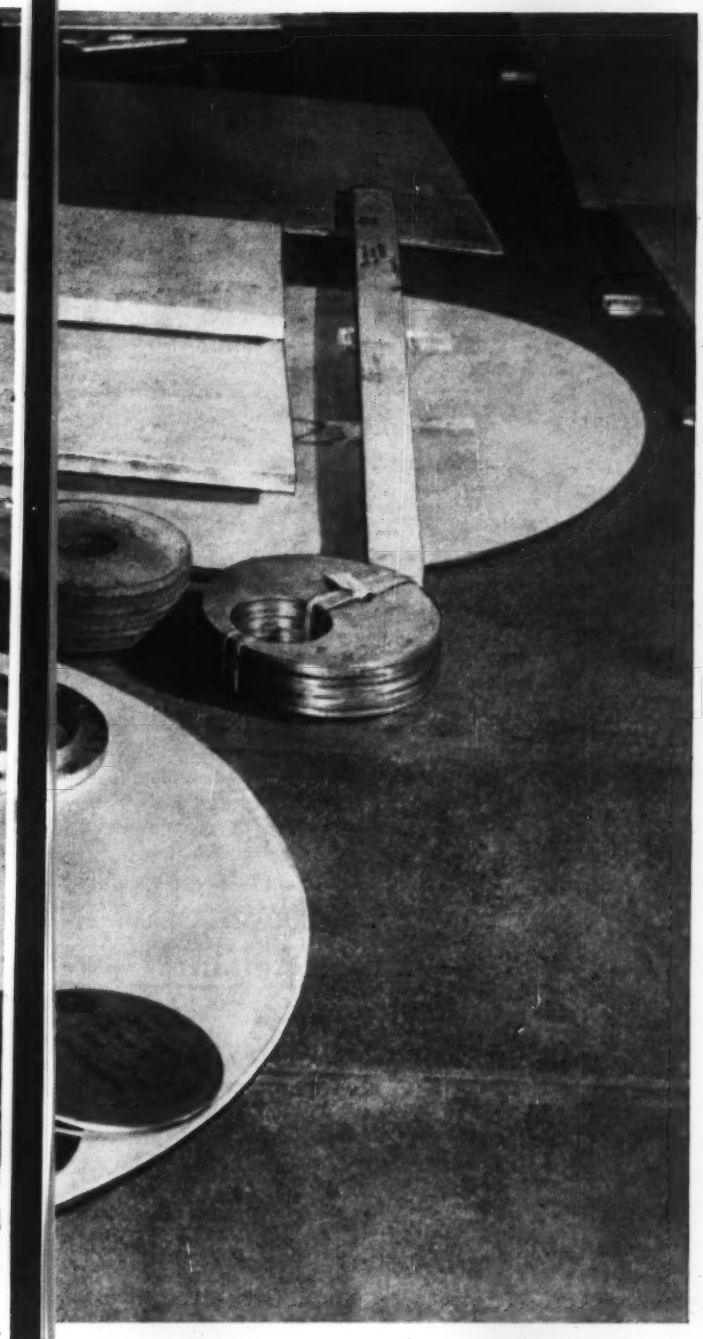
MAKE THE BEST METALS BETTER

* ORIGINATORS AND LEADING PRODUCERS OF SINGLE STACK RADIANT TUBE FURNACES

12"x 2" Disc or 200"x 132"x 2" Plate

...Carlson is your ONE source for ALL stainless steel components

STAINLESS STEEL PLATES • PLATE PRODUCTS • HEADS • RINGS



Check your drawings and you may find that you require all of the stainless steel items shown here—plates, heads, tube sheets, discs, forgings, flanges, rings, special patterns, bars, and sheets (#1 Finish) in the heavier gauges. When you buy all these material components from one source you save time, effort and money.

Your assembly costs are kept to a minimum when you use Carlson's abrasive cut material. Cleaner edges mean less true-up time on the job. There is no heat-affected zone because little heat is developed during the cutting. Fabrication is easier and the finished product is of the highest quality, more dependable in use.

Who pays freight on "offcuts" you can't use? No one, when you use Carlson's service for cutting plate to shape, ready for your fabrication. Plate is sheared, sawed, flame or abrasive cut and machined to your specifications. Eliminating freight charges on excess material lowers your costs.

There's the matter of delivery which also means time and money to you. As specialists in stainless steels, Carlson has the diversified equipment and the technical and practical knowledge to produce the plate or shapes you want, the way you want them with delivery as promised.

Stainless Steels Exclusively

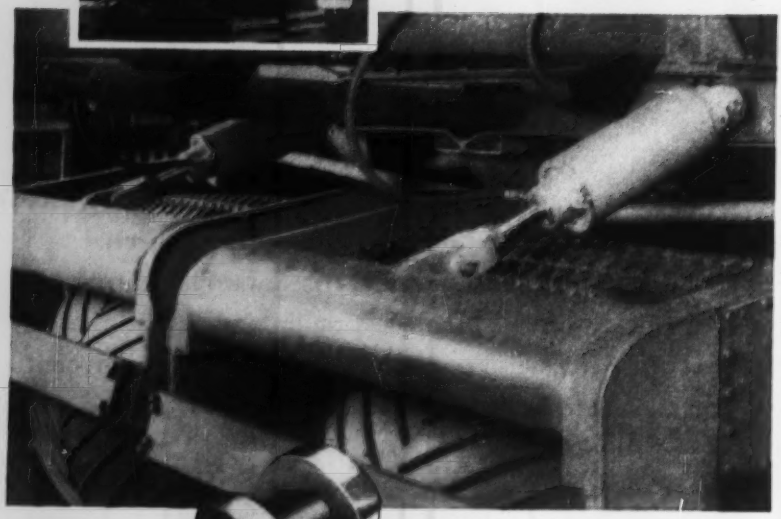
G. O. CARLSON Inc.

THORNDALE, PENNSYLVANIA

District Sales Offices in Principal Cities

DISCS • FORGINGS • FLANGES • BARS AND SHEETS (No. 1 Finish)

Arctic Cargo Carrier Depends On T-J Spacemaker CYLINDERS

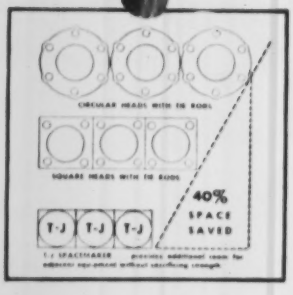


ALL MODELS... OFF SHELF DELIVERY

Saves 40% Space No Tie Rods... Greater Strength

Differential axle loading through T-J Spacemaker Air Cylinders forms a controlled walking beam in this Tera-cruiser, designed and produced for the Army Ordnance Corps by the Four Wheel Drive Co., Clintonville, Wis.

Weight of cylinders was important factor in choosing T-J Spacemakers, which reduce weight while providing same displacement and extra high safety factor. Fast delivery and space-saving features also favored T-J. Exclusive with T-J are new Super Cushion Flexible Seals for Air (to 200 P.S.I.) . . . and New Self-Aligning Master Cushion for Oil (to 750 P.S.I.). Hard chrome plated bodies and piston rods are standard, at no extra cost. Wide range of styles, capacities . . . 64,000 combinations *off the shelf!* Write for bulletin SM-155-3. The Tomkins-Johnson Co., Jackson, Mich.



MEETS WITH ALL JIC RECOMMENDATIONS

T-J TOMKINS-JOHNSON
DIVISION OF AIR AND HYDRAULIC CYLINDERS, CUTTERS, CLINCHERS

(*Concluded from page* 148)

and San Gabriel, Calif. Present facilities in Costa Mesa are at 518-24 W. 19th St., 632-40 Terminal Way, 1622 Pomona St., 1865 Newport Ave., 1878 Harbor Blvd. and 1943 Placentia Ave.

The Metropolitan New York-New Jersey sales office of **Sylvania Electric Products Inc.'s Tungsten & Chemical Division,** moved to 1000 Huyler St., Teterboro, N. J. The division's headquarters are in Towanda, Pa.

Acme Metal Engravers, manufacturer of marking devices for metal fabricators, moved to larger quarters at 1149 E. Pico Blvd., Los Angeles.

CONSOLIDATIONS

Exide Batteries of Canada Ltd. and **Willard Storage Battery Co. of Canada Ltd.** have merged under the name of Electric Storage Battery Co. (Canada) Ltd. Both companies are subsidiaries of Electric Storage Battery Co., Philadelphia.

REPRESENTATIVES

Kaiser Aluminum & Chemical Corp., Oakland, Calif., appointed Fullerton Metals of Wisconsin Inc., Milwaukee, a distributor for its aluminum products, including sheet, rod, bar, wire and extruded shapes.

Powell Pressed Steel Co., Hubbard, O., appointed Black & Gaisser Co., Evansville, Ind., and I. M. C. Equipment Co., Atlanta, as its representatives in their territories. Powell makes all-steel, cold-formed material handling containers.

Frederick B. Stevens Inc., Detroit, appointed R. F. McGuire Co. Inc., Milwaukee, distributor for its metal finishing equipment and supply line.

Besly-Welles Corp., South Beloit, Ill., appointed Libb Tool Co. Inc., Hartford, Conn., as a stocking distributor of its cutting tools and gages.

Chicago Rivet & MACHINE CO.

lower tool costs . . . get quality rivets with KEYSTONE WIRE

Tubular rivet manufacture by the cold heading extrusion process is one of the most difficult cold forming operations. The combination of a hollow punch operation plus an extreme upset makes it difficult to hold a uniform outer shell. A smooth finished appearance is necessary because rivets many times are visible in the finished products.

Chicago Rivet & Machine Co., Chicago, Illinois, has frequently consulted with Keystone Metallurgists when difficult forming problems confronted them. As a result, the right Keystone Tubular Rivet Wire has been successfully applied in the manufacture of the many intricate rivets produced by this company. They report increased die life and a higher quality finished product.

The fine *flowability* characteristics of Keystone Tubular Rivet Wire lower costs, reduce rejects and produce precision fasteners more efficiently. A Keystone Wire Specialist will gladly analyze your needs. Your inquiry is invited!

Keystone Steel & Wire Company, Peoria 7, Illinois

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COLD HEADING FACTS! Discusses methods, technical facts, wire requirements and other data.

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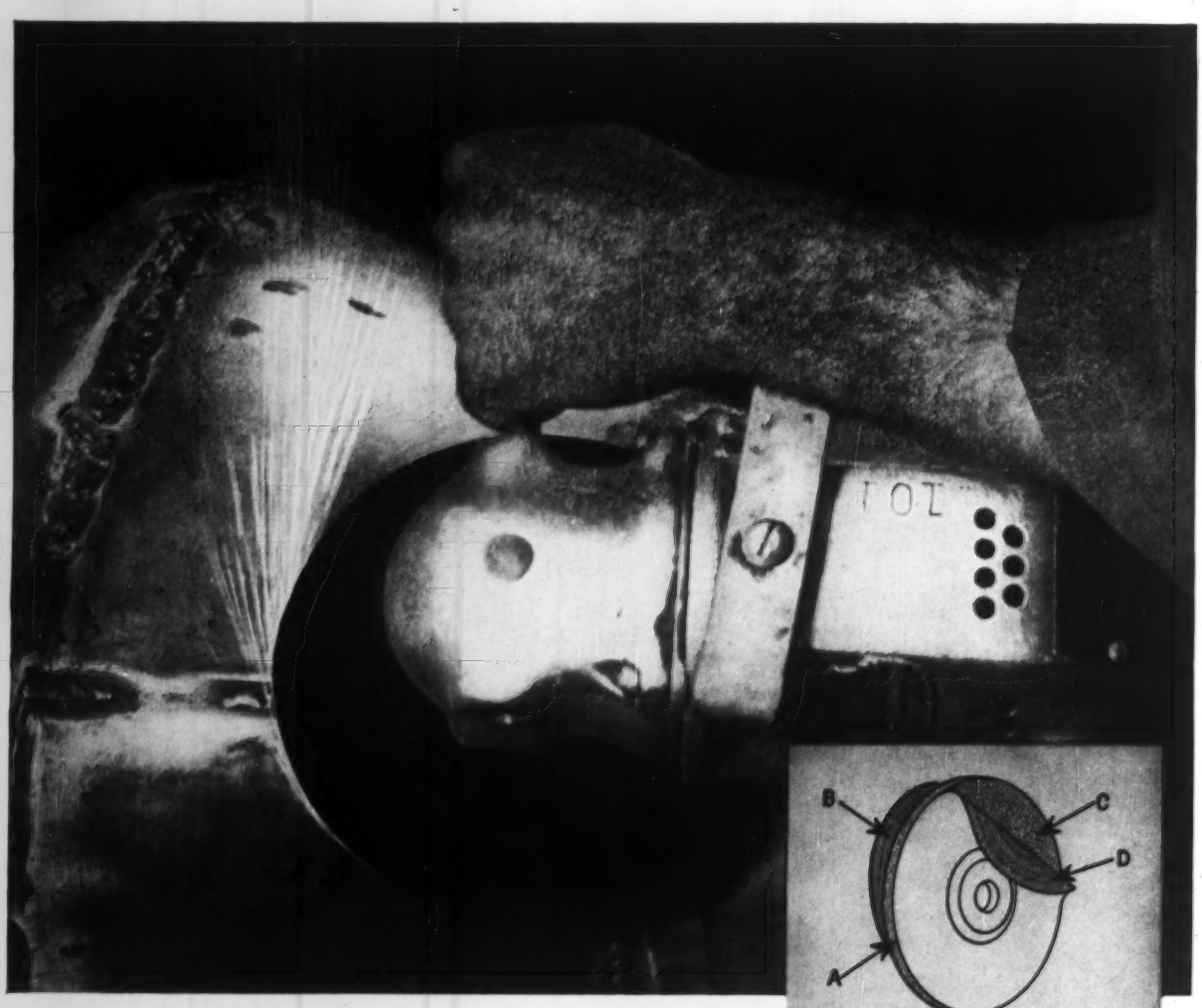
US RUBBER GRINDING WHEELS



Announcing the new U. S. Royalflex* Grinding Wheel

Hard jobs go easy with this extra-safe, new wheel. It's designed for use on portable disc sanders and right-angle portable grinders – a lightweight wheel with heavyweight stamina. For day-in, day-out use in the lightweight field, you can't beat the fast cutting action and strength of the new U. S. Royalflex Wheel.

Extra Dividend: When you buy wheels from a "U.S." sales engineer, you are dealing *direct* and are being served by a specialist—a man whose only job is to see that you get top value out of your grinding wheel dollars. Write Grinding Wheel Sales Dept., U. S. Rubber, 4300 New Haven Ave., Ft. Wayne 3, Ind.

*Reg. applied for.

US RUBBER **Mechanical Goods Division**

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United States Rubber

STEEL
The Metalworking Weekly

The Metal Show Section

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Gain Quality, Trim Costs With Special Alloys

AN OHIO trailer builder trimmed half a ton of dead weight from the frame of a tandem-axle trailer with no sacrifice in strength.

A maker of hydraulic pumps increased tool life one-third in milling slots on 8620 alloy rotors.

A ball bearing manufacturer more than doubled the life of 52100 steel bearings.

Unrelated, these three incidents have one thing in common: In each case, the manufacturer capitalized on the virtues of today's special alloys.

The trailer builder switched to high strength, low alloy steel to replace carbon steel. The pump maker ordered his 8620 in a leaded grade. The ball bearing manufacturer went over to vacuum melted 52100.

Lever — All manufacturers are reaching out for improved materials as a lever to lift product quality and lower costs. A small amount of the right special metal in a product often can give the sought-after competitive edge.

STEEL's Metal Selector for special alloys (opposite page 162) was developed to help you pick the right one for the job. It compiles data on types and uses of many alloys classed as "specials."

Included in the Selector are tables on: 1. High strength, low alloy steels. 2. Superstrength steels. 3. Leaded steels. 4. Vacuum melted metals. 5. High temperature alloys. 6. Corrosion and heat resistant castings. 7. Spring alloys. 8. Special copper alloys.

This year's Selector supplements the Metal Selector published in STEEL's Metal Show issue last year (Oct. 10), which dealt with the more standard alloys, including: 1. Wrought and casting copper alloys. 2. Wrought and casting aluminum alloys. 3. Ferrous castings. 4. Magnesium. 5. Titanium. 6. Zinc diecasting alloys. 7. Alloy and H-steels. 8. Stainless and heat resistant steels. A new edition of this Selector is planned for the 1957 Metal Show issue.

High Strength, Low Alloy Steels

Today, more than ever before, attention is focused on metals with better strength-weight ratios as manufacturers strive to make their

products smaller, lighter and stronger.

A special family of steels is tailored to a variety of tonnage applications where a relatively inexpensive, high strength, easily fabricated metal is needed. This family of high strength, low alloy steels comprises some 20-odd proprietary compositions.

Properties — Their strength (as measured by their yield point) is about 50 per cent higher than that of structural carbon steel. They are furnished in the as-rolled condition to a minimum yield point of 50,000 psi in section thicknesses up to ½-in. Their resistance to corrosion and abrasion is good.

Because of their properties, these steels are paying their way in more and more applications, though they cost more than carbon grades.

Three potential advantages account for this: Minimum cost per unit of strength and per unit of service, and minimum over-all cost due to operating savings and lower maintenance expense.

Examples—This steel is used at Delphi Body Works, Delphi, Ind., to reduce the body weight of a small truck from 1000 to 800 lb. Payload was increased 200 lb without any loss of body strength.

Fruehauf Trailer Co., Avon Lake, O., uses about 4000 lb of it on a tandem axle trailer weighing 8000 lb—in floor channels, crossmembers, floor strips, square tubing and rub rails. A half ton of dead weight is eliminated when compared with regular carbon steel.

The Pennsylvania Railroad's extra long piggyback flatcars haul two fully loaded highway trailers. High strength steel is used to reduce dead weight and stand the heavy concentration of loads encountered in the long spans between truck center plates.

Manufacturers of agricultural equipment are using these steels in combines, hay balers, corn pickers, fertilizer wagons, water tanks and tractor parts. They permit lighter, stronger construction; improved corrosion resistance shows up when parts are left out in the weather.

Although applications usually involve a situation where there is a penalty for dead weight, uses are found in a diversity of products. The material has qualified in auto and truck bumper face bars, wheels, auto brake parts, LP gas cylinders and other containers.

Superstrength Steels

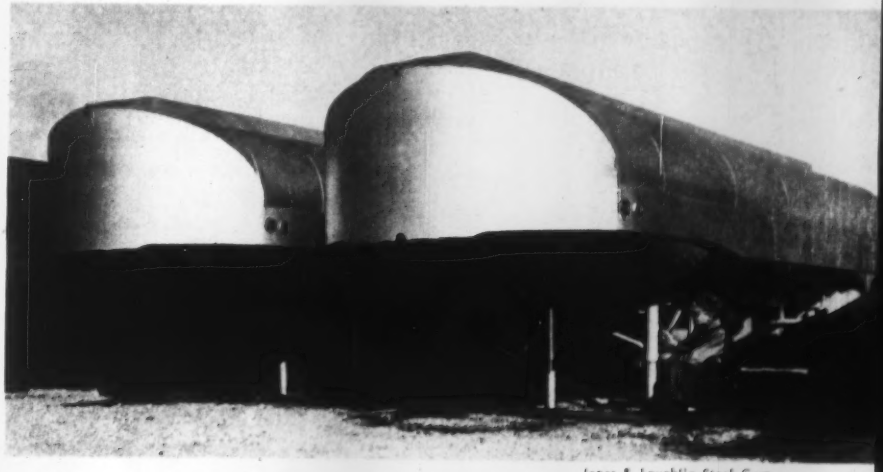
A group of low alloy, hardenable engineering steels recently has come into use where ultrahigh strength is needed.

Strength levels of 260,000 to 280,000 psi (up to 325,000 experimentally) are obtained in the quenched and tempered condition, which gives what engineers term the strongest material of the lightest weight.

Compared with a 75ST aluminum extrusion (80,000 psi), steel with a tensile strength of 220,000 has about the same strength-weight ratio. The superstrength steels, with strengths above 220,000 psi, are lighter than aluminum when load carrying ability is considered.

Start — These steels were used originally in aircraft landing gear and airframe components because their higher elastic modulus and high strength gave them an advantage over aluminum alloys.

These aircraft applications (high strength and low bulk) still represent the largest use. But as more is learned about their properties, they are finding their way into machine and automotive components, shafting, gears and other



Jones & Laughlin Steel Corp.

Tank trucks (top) made of high strength, low alloy steel sheet show gains in strength and corrosion resistance. Dead weight is reduced. Rim and wheel for passenger car (bottom) shows how another type responds to severe cold working and welding

Great Lakes Steel Corp.

Leaded 1020 steel plate is used for steam condenser baffle plates at Allis-Chalmers Mfg. Co. Typical condenser may have as many as 15,000 holes. With leaded grade, they are smoother, truer. Drill time is reduced

applications where high strength is an advantage.

Begins Here—One of the first superstrength steels in the picture was AISI 4340. When heat treated according to a special schedule, it can be hardened to 260,000-280,000 psi while its other properties remain acceptable. This is an example of bringing out special properties in a standard material through improved know-how.

Other superstrength steels are deep hardening, similar to 4340. Higher strength steels—340,000 to 350,000 psi — are in the future, and the development of usable steels with tensile strengths over 400,000 psi will not be too surprising.

As the strength level for steels is pushed upward, they can save space as well as weight. This is of interest in certain uses where weight saving, per se, is of secondary importance.

Caution — High strength steels bring up shop problems which are a little out of the ordinary. Hardness values intensify certain hazards which go unnoticed at lower strength levels, including sensitivity to: 1. Hydrogen embrittlement in plating. 2. Damage in grinding. 3. Effects of decarburization. Careful handling and regular inspection are needed all along the production line. Also design should minimize notch effects and stress raisers.

The acceptance of these steels in most cases will be a gradual process because much research remains to be done. But today's trend toward machines and equipment which operate at higher and higher stress levels will push their use.

Leaded Steels

How you benefit from leaded steels depends on what you are looking for in your machining operations. It's the material for you if you're looking for higher speeds and feeds, better surface finishes, increased tool life.

A lead content in the range of 0.25 per cent, so finely dispersed that it cannot be seen when magnified 500 times, gives leaded steels their free machining characteristics. Used in this way, lead does not affect the mechanical properties of the steel.

Benefits—The addition of lead lowers the steel's friction component by lubricating the cutting tool —where the cutting edge contacts the work and where the chip bears against the tool face. Because of the dispersion of fine lead particles, chips break up into shorter lengths than usual, quickly fall clear of the tool.

You can get a smooth finish because these steels cut cleanly. On some parts, this makes it easier to maintain tolerances. A final machining or grinding operation may be eliminated.

Take the company that was making a spiral gear for agricultural equipment out of 4140. When a leaded grade was substituted, machinability went up 25 per cent. The most important saving was a 75 per cent increase in tool life.

With nonleaded steel, the manufacturer was getting six to eight gears per tool grind; with the leaded alloy, he gets 11 to 14.

A hidden benefit shows up: Gear noise is eliminated because of the better surface finish.

Screw machines are the No. 1 consumer of leaded steels. But forgings also offer a big potential for savings.

Forgings—Leaded grades do not require modifications in forging practice. Forged parts have the same machinability as those made from leaded steel bars.

Leaded circular forgings are used in machining operations where a great deal of metal must be removed and a smooth surface finish is needed. Gear cutting, milling, drilling, boring, threading, planing, shaping or hobbing all go better on leaded grades.

Plate — A carbon grade leaded

plate is finding use in applications where extensive machining is involved. One company uses leaded steels in steam condenser plates. It reduces drill and ream time and gives a smoother, truer hole than nonleaded steel. Weldability is good.

A leaded tool steel, sold at a hardness of Brinell 300, can be readily machined at this hardness. The object is to eliminate a heat treating operation required with other grades after the tool or die is machined.

Vacuum Melted Metals

Two major areas for the development of metals with special properties are opened up by vacuum melting.

New alloys, not possible in an air furnace, can be tailored to meet specific physical and chemical requirements.

The second advantage is an improvement in the properties of existing alloys. They show up as better cleanliness, closer control, narrower hardenability ranges and improved workability.

Example—Bearing life depends a lot on freedom from inclusions and large carbide formations in the metals. Vacuum melted standard 52100 ball and ring materials have endurance limits more than twice those of standard electric furnace steel.

At elevated temperatures, the results are more striking. At 400° F under the same loading and speed, vacuum melted tool steel ball and ring materials have an increase in test life from 150 hours maximum for air melted steel to an average of 1080 hours for vacuum melted products. This increase is due to the elimination of early bearing failures.

In some cases, bearings can be made smaller when clean vacuum steels are used. This can justify a higher material cost. Vacuum melted tool steels open up new possibilities for the operation of high speed, heavily loaded bearings at elevated temperatures.

Reaction with Air—Nickel and iron base alloys containing titanium are difficult to melt cleanly in air. The main problem is formation of titanium oxides, nitrides or carbonitrides which show up in finished bars or billets as stringers.

Vacuum processing benefits such alloys as M-252, 1570 and Waspaloy. New superalloys such as Udimet 500 and 1570 can be tailored specifically for vacuum control.

Freedom from stringers and other inclusions improves hot and cold forming properties. Air melted material may crack on drastic upsetting, while vacuum material does not.

Such tearing, due to stringers, limits the amount of cold or hot reduction that can be used and may require grinding during intermediate stages of a forming cycle.

More Strength—Vacuum melting also improves high temperature stress rupture properties and makes for better impact resistance.

For example, the endurance limit of air melted A-286 at 1200°F may be between 37,000 and 47,000 psi. Consumable electrode vacuum melted material ups the limit to 47,000 psi. It can be increased to over 55,000 psi by raising the titanium content above the A-286 limit and modifying the heat treatment. The higher titanium A-286 would be hard to make from air melted ingots because of hot workability and other segregation problems.

Vacuum melted M-252 is being used for extended operation under load at 1240°F. Applications are in heavy duty land gas turbines where high rupture strength, good fatigue strength and resistance to thermal shock are needed.

Vacuum metals are found in precision mill rolls used in making film, foil and jewelry. Ultrasmooth finish is at a premium.

High purity vacuum metals are opening new doors for the electronics engineer.

High Temperature Alloys

Requirements for high temperature performance are getting stiffer.

This is true not only for military equipment — jet engines, guided missiles and the like — but also for many commercial applications in the electric power generating field and in the petroleum and process industries. As nuclear energy gains a foothold, it will set additional requirements for high temperature metals.

Higher — In steam generating stations, the maximum steam temperature was 1000°F until recently. Now 1050°F is common, and several stations are operating at 1100°F. One soon will be going at 1150°F, while another in the design stage will use 1200°F. Pressures also are going up.

The low or intermediate alloy steels, such as the 1¼ and 2¼-chromium grades, are used for metal temperatures up to 1100°F. Higher alloys are used for temperatures above this.

This vertical, thin beam is made of superstrength steel heat treated to 260,000 to 280,000 psi. It's produced by Cleveland Pneumatic Tool Co. for use as a structural member in the fuselage of one of Chance Vought Aircraft's newest fighters. Reason: The space envelope is restricted

These two cast alloy tubes were operated in the same position in a continuous annealing furnace. One failed after ten months of operation. The other, made of alloy NA22H, was still in satisfactory condition after 64 months of service

Jet Problems—Each part in a jet engine has its own material problems. Among the biggest issues that confront the jet designer are turbine buckets and the growing number of fabricated sheet metal parts.

In turbine buckets, the combinations of high tensile stress, oxidizing conditions, thermal fluctuations, impacting particles and vibrations require peak properties in all areas. Present buckets operate satisfactorily at about 1500°F at 14,000 to 18,000 psi, but materials that stand this stress level at higher temperatures are needed.

Four general classes of materials are in the picture for turbine buckets operating in the 1600°F range —nickel, cobalt, molybdenum base alloys and cermets.

It's becoming more difficult to develop nickel and cobalt alloys with adequate strength as temperatures go beyond 1600°F. Molybdenum alloys hold promise for the 1900 to 2000°F range, but poor oxidation resistance is a big problem. They require protective coatings above 900°F. Cermets, although attractive from a strength and density standpoint, suffer from a serious lack of impact strength and ductility.

Fabricated sheet metal parts are being called on to bear greater loads in applications which formerly used forged or cast parts. Today's jet engines use sheet metal parts where temperatures occasionally may reach 2100°F. Oxidation resistance is also becoming more of a requisite.

Aerodynamic Heating—Elevated temperatures are involved in structural parts of supersonic aircraft and missiles.

For years, a group of hot work die steels have been used for tools requiring a high degree of toughness and strength at elevated temperatures. A number of them have a wide hardening range. Their potentialities for aircraft structures subject to aerodynamic heating are being explored.

Alloys typical of this group keep their strength in the 200,000 psi range up to 1000°F.

Advantage — Here is another reason for interest in these "twilight" temperature zone metals (500 to 1000°F) for aircraft design. Their thermal coefficients of expansion are low, similar to those of titanium and ferritic stainless. This means stresses caused by thermal expansion are minimized.

The recurring shortages of nickel, especially in nonmilitary applications, are spurring the development of nickel-free austenitic high temperature alloys based on the manganese-chromium-nitrogen system.

Cast High Alloys

Users of industrial processing equipment look for minimum cost per operating hour for heat and corrosion resistant cast alloys employed for vital parts.

The choice of the right alloy to do a job depends on several factors: Resistance to aqueous and hot gas corrosion, hot and cold ductility, hot strength, resistance to carburization and thermal fatigue behavior. Other properties such as castability, machinability and weldability may enter the picture.

Scope—The Metal Selector gives standard designations developed by the Alloy Casting Institute for compositions in the two major divisions of cast high alloys.

The heat resistant group is designated by an "H"; the corrosion resistant, a "C."

The terms are set arbitrarily by operating temperatures.

The "C" group covers alloys used for corrosive conditions at less than 1200°F. "H" alloys are used where metal temperature is over 1200°F.

Dual Applications—Many alloys of about the same composition are used for corrosion resistance and elevated temperature service. But "H" grades usually contain more carbon than the "C" types.

Actually, if an alloy stands up

satisfactorily at high temperatures, it must resist corrosive gases. Broadly speaking, all high alloy castings are corrosion resistant.

"C" Types—Such alloys fall into these groups: Iron-chromium, iron-chromium-nickel (more Cr than Ni) and iron-nickel-chromium (more Ni than Cr).

Alloys made up of 18 to 22 per cent chromium, with 8 to 12 per cent nickel, are most widely used. The straight chromium compositions, particularly the hardenable alloys, with 11.5 to 14.0 per cent chromium, are also used extensively.

Many problems in the design and construction of fruit juice processing equipment are solved with Ni-Cr castings. Type CF-8M is used where excellent resistance to fruit acids is needed; CF-16F where a good deal of machining must be performed; and CF-20 where a good "general purpose" corrosion resistant grade is needed to stand corrosive action of citrus fruit acids.

Gas Corrosion—While high temperature strength must be considered in the selection of an alloy for many applications, maintenance of this property in severely corrosive environments is equally important. Problems may arise in applications such as furnaces, boilers and gas turbines where fuels containing sulphur are burned. One of the most severe service conditions for cast Fe-Cr-Ni alloys is in reducing flue gas atmospheres containing hydrogen sulphide.

Spring Alloys

The real heart of many products is a spring. Today's demands place more emphasis than ever before on the selection of the right spring material.

The spring designer must know what he can expect from the old stand-bys such as the high carbon steels. He must also be familiar with special alloys developed to cope with problems of high stress, heat, corrosion and constant modulus.

For many products, the space left for springs is becoming smaller, which means more performance from the usual spring. Often required are greater accuracy in spring rate, lower straight line error, smaller hysteresis and less drift error.

There's the need for constant strength with temperature changes and long life at high stresses, perhaps even at elevated temperatures.

Constant Modulus — Springs of special alloys that maintain constant stiffness through a temperature range are called constant modulus alloys. Steel springs generally become weaker with increasing temperature, stiffer with decreasing temperature. This can be serious with some products.

The original constant-modulus alloy, Elinvar, gets its spring properties from cold working, but working stresses must be kept low. A modification, Iso Elastic, allows higher stress limits. This alloy also has low hysteresis and drift error. These properties make it especially valuable for precision instruments.

Another constant-modulus alloy, Ni Span C, can be formed in the soft state and then hardened to get spring properties. With accurate processing, hysteresis and drift are low, making it an excellent alloy for precision instruments, too.

High Stresses—A special alloy called Cobenium (formerly Elgiloy) is gaining a reputation for long life in applications where springs must operate at extremely high stresses (see article by M. Gerard Fangemann, *Machine Design*, May 31, p. 121).

Springs are requiring better corrosion resistance. Various types of stainless steels are used here. Monel has excellent salt water resistance. Another nickel alloy, Inconel, is used at elevated temperatures.

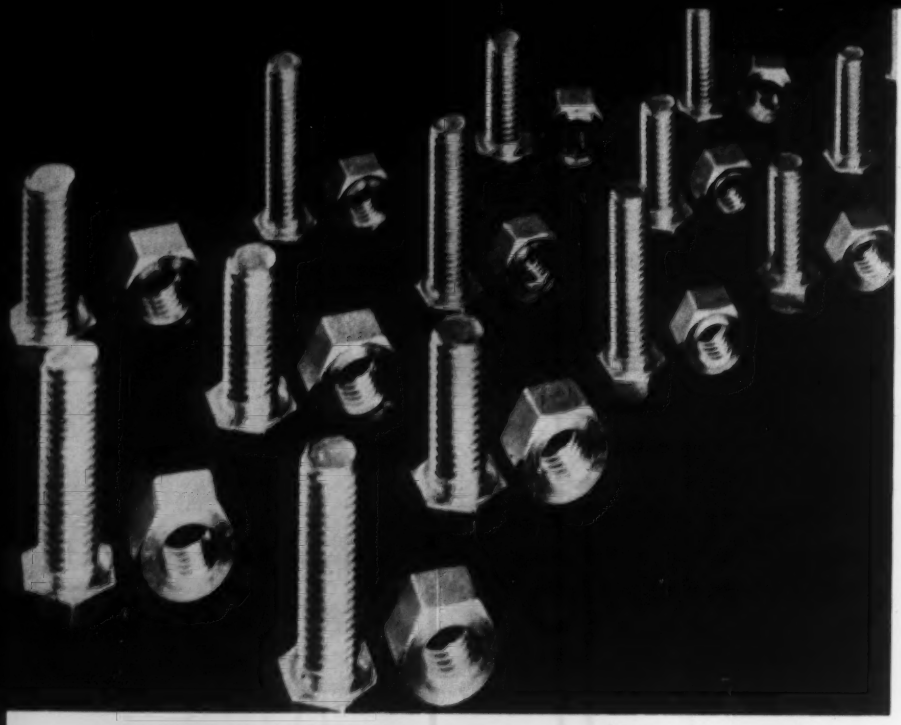
Copper base materials are used where good conductivity is a prime requirement. Phosphor bronze and beryllium copper withstand considerable stresses.

Widely Used — High carbon spring steels still do many jobs. Music wire is widely used because it has the highest tensile properties under repeated loading, with excellent life expectancy. Hard drawn MB grade is used for low stress applications, and the oil tempered HB grade is used where life expectancy is not important enough to justify music wire.

Alloy steels, such as chrome-vanadium, chrome-silicon and chrome-moly-vanadium, take over where music wire leaves off in

These high temperature alloy struts for J-57 engines are formed with simple, standard dies in a Hydropress and punch press. Time was saved in spotwelding by using stencils instead of templates

Ryan Aeronautical Co.



Bolts and nuts fabricated from silicon bronze or other high strength copper base alloys have the strength of a steel with good toughness and malleability. They retain the corrosion resistance of copper

high stress and fatigue applications or in elevated temperature uses.

Copper Alloys

The aluminum and silicon bronzes and other special copper base alloys are worthy supplements to the time-tested phosphor bronzes, cupro-nickels, nickel silvers and other standard alloys.

Aluminum added to brass increases its strength and improves its resistance to impingement corrosion from turbulent water or other liquids flowing at high velocity.

A small amount of silicon in brass lowers its thermal and electrical conductivity — makes it particulary suitable for welding. Silicon added to aluminum bronze increases its strength, corrosion resistance and machinability.

Al-Si Bronzes—Looking at the special aluminum silicon bronzes, you can find a composition that is one of the strongest nonferrous hot forging alloys.

Another one is an exceptionally high strength rod alloy for screw machine products and forgings. Its machinability is 60 (free cutting brass is 100). Studs, bolts and forgings made from this alloy are well suited to heavy duty switchgear and electrical hardware, especially for outdoor construction.

Ni-P-Bronzes—The nickel phosphorus bronzes have several outstanding characteristics: Good machinability, hot and cold workability, conductivity, high strength, age hardenability, high fatigue strength and good corrosion resistance. Accurately proportioned amounts of nickel and phosphorus give age hardening or heat treatment properties.

Uses are in forgings and screw machine parts requiring high strength, hardenability, extensive machining, corrosion resistance, copper color and good conductivity. Typical parts include bolts, welding torch tips, tierods, compression fittings, sleeves, bushings, gears, pinions, nuts, marine hardware and electrical connectors.

Te-Coppers—The tellurium copper special alloys are relatively free machining. They are used for transformer and circuit breaker terminals, studs, bolts, nuts and current carrying parts of apparatus that require fine machine work.

Forgeable bearing bronzes of lightweight, high strength copper and zinc base alloys offer many possibilities. Because they have excellent hot working properties, they can be forged into relatively complicated shapes that are closer to size and lighter than sand castings. As material for bearings, gears, connecting rods, propeller shafts and many other parts, these alloys offer good bearing, mechanical corrosion resistance and machinability properties.

For example, a manufacturer of hydraulic transmissions replaced a tin bronze sand cast worm gear in the transmission with a bearing bronze forged worm. Result was a decrease in gear blank weight of 40 per cent, greatly reduced machining time and longer tool life. The dense structure of the forged gear increased resistance to wear.

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STEEL
OCTOBER 1, 1956

- Leaded Steels
- Spring Alloys
- Copper Alloys
- Cast High Alloys
- Superstrength Steels
- Vacuum Melted Metals
- High Temperature Alloys
- High Strength, Low Alloy Steels

Metal Selector

Here is practical information needed to help you select the right special metal for the job. The more standard alloys, covered last year, will be brought up to date in 1957

LEADED STEELS

Chemical composition ranges and limits*—Except as noted, all steels contain lead within range 0.15-0.35

AISI Number or Trade Name	C	Mn	P	S	Si	Ni	Cr	Mo	Forms Available and Source—See Key
Ledloy A	0.15 max	0.75–1.25	0.04–0.09	0.25–0.35	0.10 max	.....	.....	.....	HR bars C17, I-2 CF bars B5, C17, N5, P5, R12, S17, W8, W18 Billets C17
Amer-Led A	0.15 max	0.75–1.25	0.04–0.09	0.25–0.35	.....	.....	.....	.....	HR bars A7 CF bars A7, N5
J&L Type"A"OH	0.15 max	0.75–1.25	0.04–0.09	0.25–0.35	.....	.....	.....	.....	CF bars J5
Yolead OH-"A"	0.13 max	0.80–1.20	0.04–0.09	0.25–0.33	.....	.....	.....	.....	HR bars Y1; CF bars Y1
Yolead Bess	0.13 max	0.70–1.10	0.07–0.12	0.20–0.33	.....	.....	.....	.....	HR bars Y1; CF bars Y1
La-Led	0.13 max	0.80–1.20	0.04–0.09	0.25–0.35	.....	.....	.....	.....	CF bars L2
Super La-Led	0.13 max	0.80–1.20	0.04–0.09	0.40–0.50	.....	.....	.....	.....	CF bars L2
Ledloy B	0.15 max	0.85–1.35	0.04–0.09	0.36 min	.....	.....	.....	.....	HR bars I-2; CF bars B5, P5, R12, W8
Amer-Led "B"	0.15 max	0.85–1.35	0.04–0.09	0.36 min	.....	.....	.....	.....	HR bars A7; CF bars A7
C1015	0.13–0.18	0.30–0.60	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1016	0.13–0.18	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1017	0.15–0.20	0.30–0.60	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1018	0.15–0.20	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17, I-2 CF bars B5, C17, J5, N5, P5, W8 Billets C17
C1020	0.18–0.23	0.30–0.60	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1020	0.17–0.24	0.30–0.60	0.04	0.05	.....	.....	.....	.....	Plate I-2
New E-Z Cut	†0.24	1.25	0.02	0.025	0.07	.....	.....	.....	Plate R12
C1022	0.18–0.23	0.70–1.00	0.04	0.05	.....	.....	.....	.....	HR bars C17, I-2; CF bars B5, C17; billets C17
C1024	0.19–0.25	1.35–1.65	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1025	0.22–0.28	0.30–0.60	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1026	0.22–0.28	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17, I-2; CF bars B5, C17; billets C17
C1035	0.32–0.38	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1036	0.30–0.37	1.20–1.50	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1037	0.32–0.38	0.70–1.00	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1040	0.37–0.44	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1041	0.36–0.44	1.35–1.65	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1045	0.43–0.50	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17, I-2; CF bars B5, C17, J5, P5, W8, W18; billets C17
C1056	0.48–0.55	0.60–0.90	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1052	0.47–0.55	1.20–1.50	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1095	0.90–1.03	0.30–0.50	0.04	0.05	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
B1113 J&L 1113 Bess	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33	.....	.....	.....	.....	CF bars J5
C1115	0.13–0.18	0.60–0.90	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1117	0.14–0.20	1.00–1.30	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17, I-2, W8; CF bars B5, C17, R12, W18; billets C17
C1117 Jalcase 4	0.14–0.20	1.00–1.30	0.04 max	0.08–0.13	.....	.....	.....	.....	CF bars J5, P5
Leaded Rycase	†0.17	1.25	0.025	0.10	0.08	.....	.....	.....	CF bars R12
C1118	0.14–0.20	1.30–1.60	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars C17, W8; billets C17
C1119	0.14–0.20	1.00–1.30	0.04	0.24–0.33	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1120	0.18–0.23	0.70–1.00	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1137	0.32–0.39	1.35–1.65	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars C17, S17, W8, W18; billets C17
C1137 Jalcase 7	0.32–0.39	1.35–1.65	0.04 max	0.08–0.13	.....	.....	.....	.....	CF bars J5
C1141	0.37–0.45	1.35–1.65	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars B5, C17, W18; billets C17
C1144	0.40–0.48	1.35–1.65	0.04	0.24–0.33	.....	.....	.....	.....	HR bars C17; CF bars B5, C17; billets C17
C1146	0.42–0.49	0.70–1.00	0.04	0.08–0.13	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1153	0.49–0.56	1.30–1.65	0.04	0.23–0.33	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1160	0.55–0.65	1.30–1.65	0.04	0.24–0.33	.....	.....	.....	.....	HR bars C17; CF bars C17; billets C17
C1213	0.13 max	0.70–1.00	0.07–0.12	0.24–0.33	.....	.....	.....	.....	HR bars I-2; CF bars B5
J&L 1213 OH	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33	.....	.....	.....	.....	CF bars J5, N5
A1335	0.33–0.38	1.60–1.90	0.04	0.04	0.20–0.35	.....	.....	.....	HR bars C17; CF bars C17; billets C17
4028	0.25–0.30	0.70–0.90	0.04	0.035–0.050	0.20–0.35	.....	.....	0.20–0.30	HR bars C17; CF bars C17; billets C17
4032	0.30–0.35	0.70–0.90	0.04	0.04	0.20–0.35	.....	.....	0.20–0.30	HR bars C17; CF bars C17; billets C17

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LEADED STEELS — (continued)

AISI Number or Trade Name	C	Mn	P	S	Si	Ni	Cr	Mo	Forms Available and Sources—See Key
4037	0.35-0.40	0.70-0.90	0.04	0.04	0.20-0.35	.....	.....	0.20-0.30	HR bars C17; CF bars B5, C17; billets C17
4047	0.45-0.50	0.70-0.90	0.04	0.04	0.20-0.35	.....	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4118	0.18-0.23	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.40-0.60	0.08-0.15	HR bars C17; CF bars C17; billets C17
4130	0.28-0.33	0.40-0.60	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars C17; billets C17
T84132	0.30-0.35	0.45-0.65	0.04	0.04	0.20-0.35	.....	0.90-1.20	0.08-0.15	HR bars C17; CF bars C17; billets C17
4135	0.33-0.38	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars C17; billets C17
4137	0.35-0.40	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars C17; billets C17
4140	0.38-0.43	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars A7, C17, I-2, R12; CF bars A7, B5, C17, L2, N5, R12, S17, W8, W18; billets C17
Ryeut 40	†0.41	0.85	0.025	0.031	0.28	.....	0.92	0.19	HR bars R12; CF bars R12
4142	0.40-0.45	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars B5, C17, W18; billets C17
4145	0.43-0.48	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars B5, C17; billets C17
4147	0.45-0.50	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars B5, C17; billets C17
4150	0.48-0.53	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.80-1.10	0.15-0.25	HR bars C17; CF bars B5, C17; billets C17
New Ryeut 50	†0.50	0.85	0.019	0.023	0.28	.....	0.96	0.21	HR bars R12; CF bars R12
4320	0.17-0.22	0.45-0.65	0.04	0.04	0.20-0.35	1.65-2.00	0.40-0.60	0.20-0.30	HR bars C17; CF bars C17; billets C17
4340	0.38-0.43	0.60-0.80	0.04	0.04	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30	HR bars C17; CF bars C17; billets C17
4615	0.13-0.18	0.45-0.65	0.04	0.04	0.20-0.35	1.65-2.00	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4617	0.15-0.20	0.45-0.65	0.04	0.04	0.20-0.35	1.65-2.00	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4620	0.17-0.22	0.45-0.65	0.04	0.04	0.20-0.35	1.65-2.00	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4640	0.38-0.43	0.60-0.80	0.04	0.04	0.20-0.35	1.65-2.00	.....	0.20-0.30	HR bars C17; CF bars B5, C17, W18
4720	0.17-0.22	0.50-0.70	0.04	0.04	0.20-0.35	0.90-1.20	0.35-0.55	0.15-0.25	HR bars C17; CF bars C17; billets C17
4815	0.13-0.18	0.40-0.60	0.04	0.04	0.20-0.35	3.25-3.75	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4820	0.18-0.23	0.50-0.70	0.04	0.04	0.20-0.35	3.25-3.75	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
4880	0.27-0.34	0.40-0.65	0.04	0.04	0.20-0.35	3.25-3.75	.....	0.20-0.30	HR bars C17; CF bars C17; billets C17
5046	0.43-0.50	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.20-0.35	.....	HR bars C17; CF bars C17; billets C17
50B44	0.42-0.50	0.70-1.00	0.04	0.04	0.20-0.35	.....	0.35-0.60	(B 0.0005	HR bars C17; CF bars C17; billets C17
50B46	0.43-0.50	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.20-0.35	min)	HR bars C17; CF bars C17; billets C17
5117	0.15-0.20	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.70-0.90	.....	HR bars C17; CF bars C17; billets C17
5120	0.17-0.22	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.70-0.90	.....	HR bars C17; CF bars B5, C17; billets C17
5132	0.30-0.35	0.60-0.80	0.04	0.04	0.20-0.35	.....	0.75-1.00	.....	HR bars C17; CF bars C17; billets C17
5135	0.33-0.38	0.60-0.80	0.04	0.04	0.20-0.35	.....	0.80-1.05	.....	HR bars C17; CF bars C17; billets C17
5140	0.38-0.43	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.70-0.90	.....	HR bars C17; CF bars C17; billets C17
5160	0.48-0.55	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.70-0.90	.....	HR bars C17; CF bars C17; billets C17
5160	0.56-0.65	0.75-1.00	0.04	0.04	0.20-0.35	.....	0.70-0.90	.....	HR bars C17; CF bars C17; billets C17
6120	0.17-0.22	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.70-0.90	(V 0.10 min)	HR bars C17; CF bars C17; billets C17
6150	0.48-0.53	0.70-0.90	0.04	0.04	0.20-0.35	.....	0.80-1.10	(V 0.15 min)	HR bars C17; CF bars C17; billets C17
8615	0.13-0.18	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8617	0.15-0.20	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8620	0.18-0.23	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17, I-2, R12; CF bars B5, C17, I-2, L2, R12, W18; billets C17
Ryeut 20	†0.21	0.80	0.023	0.029	0.31	0.63	0.52	0.22	HR bars R12; CF bars R12
8622	0.20-0.25	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8625	0.23-0.28	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8630	0.28-0.33	0.70-0.90	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8640	0.38-0.43	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars B5, C17, W18; billets C17
8642	0.40-0.45	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8645	0.43-0.48	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
8647	0.45-0.50	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars C17; billets C17
Ryeut 47	†0.47	0.87	0.020	0.024	0.29	0.58	0.50	0.21	HR bars R12; CF bars R12
8650	0.48-0.53	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25	HR bars C17; CF bars B5, C17; billets C17
8747	0.45-0.50	0.75-1.00	0.04	0.04	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30	HR bars C17; CF bars C17; billets C17
Nitralloy G Mod.	0.38-0.45	0.40-0.70	0.025	0.025	0.20-0.40	(Al 0.85-1.20)	1.40-1.80	0.30-0.45	HR bars C17; CF bars C17; billets C17
52100	0.95-1.10	0.25-0.45	0.025	0.025	0.20-0.35	.....	1.30-1.60	.....	HR bars C17; CF bars C17, P24; billets C17
303-Pb	0.15 max	2.00 max	0.04 max	.....	1.00 max	7.00-9.00	17.00-19.00 (Pb + S 0.20 min)	0.60 max	Bars, wire, cold drawn, centerless ground J6
M2 Molite Smoothcut	0.85	.....	W 6.40	0.075	.....	V 1.85	4.15	5.00	Centerless ground HR bars, forged blocks, discs and rings C13
D2 Atmodie Smoothcut	1.50	.....	.....	0.075	.....	V 0.85	12.00	0.85	Centerless ground HR bars, forged blocks, discs and rings C13
A2 E-S Die Smoothcut	1.00	.....	.....	0.075	.....	V 0.25	5.25	1.15	Centerless ground HR bars, forged blocks, discs and rings C13
S5 CKC Smoothcut	0.55	0.80	.....	0.125	2.00	V 0.25	0.25	.....	Centerless ground HR bars, forged blocks, discs and rings C13
Speed-Cut	0.43	0.85	0.03 max	0.03 max	0.30	.....	1.15	0.50	HR bars V2; forgings V2

Key To Producers

A7 American Steel & Wire Div., U. S. Steel Corp., Cleveland
B5 Bliss & Laughlin Inc., Harvey, Ill.
C13 Columbia Tool Steel Co., Chicago Heights, Ill.
C17 Copperweld Steel Co., Warren, O.
I-2 Inland Steel Co., Chicago
J5 Jones & Laughlin Steel Corp., Pittsburgh
J6 Joslyn Stainless Steels, div. Joslyn Mfg. & Supply Co., Chicago
L2 LaSalle Steel Co., Chicago
N5 Nelson Steel & Wire Co., Franklin Park, Ill.
P24 Peterson Steels Inc., Union, N. J.
P5 Pilgrim Drawn Steel Div., Automotive Materials Corp., Plymouth, Mich.
R12 Joseph T. Ryerson & Son Inc., Chicago
S17 Superior Drawn Steel Co., Monaca, Pa.
V2 Vanadium Alloys Steel Co., Latrobe, Pa.
W8 Western Automatic Machine Screw Co., div. Standard Screw Co., Elyria, O.
W18 Wyckoff Steel Co., Pittsburgh
Y1 Youngstown Sheet & Tube Co., Youngstown

Note: Designation of producers is the same as that used in STEEL's weekly price section.

*Until AISI procedure is established, leaded steels may be supplied in both standard and nonstandard ranges.

†Typical analysis.

1. Alco Products Inc., Schenectady, N. Y., will furnish leaded steel in all AISI open hearth grades in forged and rolled rings from 18 to 45 in. over-all diameter and in ingots up to 50,000 lb. These are designated by an "L." Thus: 10L45 for 1045, etc.
2. Producers and cold finish suppliers can furnish other grades on production orders.

APPLICATIONS: Outstanding property of leaded steels is improved machinability. Lead lubricates the cutting action of the tool—allows heavier cuts & faster speeds. Longer tool life comes from lower temperature at the tool-part interface. Better surface finish is obtained. In some cases a roughing tool may give the needed surface without a finishing operation. Leaded grades need less horsepower for machining, which is significant in handling tougher alloys.

Carbon and alloy bar grades are ideally suited for screw machine parts & other applications requiring high production rates. Typical parts being made: Nuts, bolts, screws, studs, clutch & valve parts, hand tools, spark plug shells, universal joint bearings, hose connections and lubrication fittings, pipe plugs, couplings, gears, pinions, spindles, collets, sprockets, arbors, axles, boring bars, power take-off shafts, brake dies, roller chain links and pins, air tool cylinders, shafts for door knobs, hydraulic fittings, rifle breech blocks, bushings and rolls. Leaded steel plate is used for rubber molds, jigs, racks, gears, fixtures, die bases, rings, ring gears and machine beds. Leaded circular forgings are used in gears, turbines, roller and ball bearings, saw mill equipment and oil drilling rigs. Applications for hot bars and billets in forge shops are growing rapidly.

SPRING ALLOYS

Name & Specification	Nominal Composition* & A
HIGH CARBON	
Music Wire ASTM A228-51	C 0.70-1.00; Mn 0.20-0.60—Widely used tensile strength; stands high stresses. Torsion working stress 90,000-180,000 psi 150,000-350,000 psi.
MB Grade Oil Tempered ASTM A229-41	C 0.55-0.75; Mn 0.60-1.20—General purpo where cost of music wire is prohibitive. No impact loading or use above 350°F. Torsi 130,000 psi; bending working stress 120,0
MB Grade Hard Drawn ASTM A227-47	C 0.45-0.75; Mn 0.60-1.20—Cheapest sprin poses. Used where accuracy of loads and Temperature limit 250°F. Torsion work psi; bending working stress 100,000-200,00
MB Grade Soft or Untempered	C 0.55-0.75; Mn 0.60-1.20—Used in helic where severe forming is required. May be nealed at final size) or drawn one or mor ment. Hardened and tempered after fabric
HB Grade Oil Tempered	C 0.71-0.85; Mn 0.60-0.90—Uses similar t Higher carbon content results in higher ten mended for use above 350°F. Torsion wor psi; bending working stress 125,000-265,00
HB Grade Hard Drawn	C 0.71-0.85; Mn 0.60-0.90—Uses similar t Tensile strength higher than hard drawn music wire. Uses are about halfway betwe
HB Grade Soft	C 0.71-0.85; Mn 0.60-0.90—Used in helic where moderate to severe forming is requir hardened and tempered after fabrication.
Extra HB Grade Oil Tempered	C 0.86-1.05; Mn 0.30-0.60—Used for vari high quality. Not recommended for use abo stress 90,000-145,000 psi; bending working st
Extra HB Grade Soft	C 0.86-1.05; Mn 0.30-0.60—Applications sa
Upholstery Grade	C 0.45-0.70; Mn 0.60-1.20—Not suitable f where loads and fatigue life are not a fact and hooks, mattress and upholstery spring
ALLOY STEELS	
Chrome-Vanadium ASTM A231-41 SAE 6150	C 0.48-0.53; Mn 0.70-0.90; Cr 0.80-1.10; S For high stress conditions where fatigue Good for shock & impact loading. Used springs & for temperatures up to 425°F. 100,000-130,000 psi; bending working stres
Silicon-Manganese ASTM A59-49 SAE 9260	C 0.55-0.65; Mn 0.70-1.00; Si 1.80-2.20—Us trucks & as a substitute for more expensiv in pretempered wire.
Chrome-Silicon SAE 9254	C 0.50-0.60; Mn 0.50-0.80; Si 1.20-1.60; stressed springs requiring long life that are such as recoil springs on guns. Can be heat RC 50 to 53. May be used up to 475°F 115,000-150,000 psi; bending working stres
Chrome-Molybdenum	Developed for helical springs for piston rod Has been used at 800°F.
Chrome-Moly-Nickel AISI 8650 ASTM A332-51T Grade 8650	C 0.48-0.53; Mn 0.75-1.00; Si 0.20-0.35; N Mo 0.15-0.25—Developed as an alternate f 6150. Used in large sections for hot formed
Chrome-Moly-Nickel AISI 8660 ASTM A332-51T Grade 8660	C 0.55-0.65; Mn 0.75-1.00; Si 0.20-0.35; C Mo 0.15-0.25—Uses same as for AISI 8650
VALVE SPRING STEELS	
High Carbon Valve Spring Wire ASTM A230-47	C 0.60-0.75; Mn 0.50-0.90; Si 0.12-0.30—Va & aircraft engines and other springs requiri Uniform properties, smooth finish & ten 250,000 psi.
Chrome-Vanadium Valve Spring Wire ASTM A232-47	C 0.45-0.55; Mn 0.60-0.90; Si 0.12-0.30; Cr Automotive & aircraft valve springs. Stand impact loading up to 400°F, with long fatig
TOOL STEELS	
Drill Rod	C 0.95-1.25—Occasionally used for springs stresses.
High Speed Tool Steels	C 0.72; Mn 0.25; Cr 4.00; W 18.25; V 1.1 M2 (sometimes 18-4-1) are used up to 1000 up to 70,000 psi. Main application: Valve steam.
STAINLESS STEELS	
Type 302	Ni 8.0-10.0; Cr 17.0-19.0; C 0.15 max—Fur tensile strength with lower permeability t magnetic when annealed. General purpose Can be used at temperatures to 550°F. 45,000-140,000 psi; bending work stress 60,
Type 304	Ni 8.0-12.0; Cr 18.0-20.0; C 0.08 max—Uses more uniform tensiles because of restrict slightly lower tensiles than for same amou properties & corrosion resistance similar stress 45,000-140,000 psi; bending working
Type 316	Ni 10.0-14.0; Cr 16.0-18.0; Mo 2.0-3.0; Mn tion of Mo increases corrosion resistance to larly the halogens. Nonmagnetic, but low similar amounts of cold reduction. Torsio 120,000 psi; bending working stress 55,000
17-7 PH	Ni 7.0; Cr 17.0; C 0.07; Al 1.0—Tensile st to music wire. Good corrosion resistance. C Torsion working stress 134,000-160,000 psi 195,000-235,000 psi.
17-4 PH	Ni 4.0; Cr 17.0; Cu 4.0—Excellent corros stresses to 90,000 psi.

Name & Specification	Nominal Composition* & Applications
Type 414	Ni 1.25-2.5; Cr 11.5-13.5—Not satisfactory for low temperatures. Hardened by heat treatment.
Type 420	Cr 12.0-14.0; C 0.15 min—Only used for springs in heat treated condition. Hardened after forming. Frequently used for rifle recoil springs.
Type 431	Ni 1.5-2.5; Cr 15.0-17.0; C 0.20 max—Generally used as quenched-tempered; can be used in hard drawn condition for springs. Cold drawing gives tensile strength in the order of regular spring wire. Used in appliance control springs where maintenance is a factor.
COPPER BASE ALLOYS	
Cartridge Brass 70% ASTM B134-51 SAE 80	Cu 70, Zn 30—A hard-drawn material usually used in the spring-hard temper. Inexpensive; high electrical conductivity. Low tensile strength & poor spring qualities. Used in flat stampings where sharp bends are needed. Torsion working stress 30,000-60,000 psi; bending working stress 40,000-60,000 psi.
Phosphor Bronze (A), 5% ASTM B159-54 SAE 81	Cu 94+; Sn 3.5-5.8; P 0.03-0.35—Combines good tensile strength, hardness, electrical conductivity, corrosion resistance with low cost. Used for contact fingers in switches. Useful up to 212°F. Torsion working stress 50,000-86,000 psi; bending working stress 60,000-111,000 psi.
Beryllium Copper ASTM B-194-55 (flat strips) ASTM B-196-52 (round sections)	Cu 98.0; Be 2.0—Electrical switches & components. Can be formed in annealed condition & precipitation hardened to get high tensile strength. Torsional working stress 65,000-95,000 psi; bending working stress 100,000-150,000 psi.
Copper-Manganese	Copper-manganese, nickel-silver & cupro-nickel have a silvery white color that harmonizes with surroundings. Used for contact fingers. Good electrical conductivity, corrosion resistance.
Nickel Silver 55-18 ASTM B-122 (flat) ASTM B-151 (round)	Cu 55.0; Zn 25.0; Ni 18.0
Cupro-Nickel	Cu 70.0; Ni 30.0
Silicon Bronze (A) ASTM B-97	Si 2.8-3.5—Silicon bronze & aluminum bronze have excellent resistance to corrosion. Useful for special applications requiring large tonnages.
Aluminum Bronze ASTM B-150-54(round) ASTM B-169-55(flat)	Al 4.0-7.0
Tin-Brass	Useful for spring & contact application in electrical and radio field, such as socket contacts, fuse clips.
NICKEL-BASE ALLOYS	
Monel QQ-N-281a Cl.A MIL-N-894 C (Cl.A)	Ni 67.0; Cu 30.0—Resists sea water corrosion, is nearly nonmagnetic. Often used in food & beverage equipment. Torsion working stress 50,000-63,000 psi; bending working stress 88,000-107,000 psi. Temperature range: —100 to 400°F.
"K" Monel QQ-N-286a MIL-W-4471(Comp. A) MIL-N-17506A (Cl.A)	Ni 63.0-70.0; Al 2.0-4.0; Ti 0.25-1.00; Cu Bal.—A precipitation-hardening alloy. Age hardening gives a higher tensile strength than Monel. Nonmagnetic and can be used at temperatures of —100 to 450°F at working stresses under 45,000 psi. Torsion working stress 60,000-70,000 psi; bending working stress 110,000-120,000 psi.
Inconel QQ-W-390a	Ni 72.0 min; Cr 14.0-17.0; Fe 6.0-10.0—Nonmagnetic, good corrosion resistance, stands temperatures to 650°F. Used in steam valves, regulating valves, springs in boilers, compressors, turbines, jet engines. Torsion working stress 55,000-80,000 psi; bending working stress 110,000-135,000 psi.
Inconel "X" AMS-5698 AMS-5699	Ni 70.0 min; Cr 14.0-17.0; Fe 5.0-9.0; Ti 2.0-2.5; Al 0.4-1.0; Cb 0.7-1.2—A precipitation-hardening alloy. Nonmagnetic and can be used in larger sections than Inconel at higher tensile strengths. May be used up to 1100°F, depending on design stresses. Torsion working stress 55,000-85,000 psi; bending working stress 110,000-135,000 psi.
Duranickel No applicable specification	Ni 93.0 min; Al 4.0-4.75; Ti 0.25-1.0—Corrosion resistant, high tensile strength, precipitation hardening material. Used at same stresses as Inconel, but not above 600°F. In most cases, Inconel is used in place of this alloy, at less cost.
FLAT HIGH-CARBON	
Cold Rolled Spring Steel, Blue Tempered or Annealed	C 0.65-0.80; Mn 0.30-0.90—Most popular flat cold-rolled spring steel. Used for spring clips, flat springs, motor power, spiral springs.
Cold Rolled Spring Steel, Blue Tempered Clock Steel	C 0.90-1.05; Mn 0.30-0.50—Used principally for clock and motor springs. Can withstand higher stress than the 0.65-0.80 carbon grade. Used for instrument & flat springs that have limited forming requirements.
Cold Rolled Flat Spring Steel, Hard Rolled or Annealed	C 0.45-0.65; Mn 0.60-0.90—Used for miscellaneous springs, washers, etc. In annealed condition will withstand more severe deformation than the 0.65-0.80 carbon grade.
CONSTANT MODULUS ALLOYS	
Elinvar Extra	Ni 43.0; Fe 47.0; Cr 5.00; Ti 2.80—Precipitation hardening alloy developed by Hamilton Watch Co. Temperature range: —50 to 150°F. Control, timing & measuring equipment.
Ni-Span-C	Ni 41.0-43.0; Cr 4.9-5.5; Ti 2.1-2.5; Fe Bal.—Precipitation hardening alloy developed by International Nickel Co. Ferromagnetic up to 400°F; becomes nonmagnetic at higher temperatures. Excellent thermoelastic characteristics. Torsion working stress 60,000 psi; bending working stress 15,000-110,000 psi.
Iso-Elastic	Ni 35.0-37.0; Cr 7.0-7.6; Mo 0.35-0.70; Fe Bal.—Used principally in dynamometers, instruments & food weighing scales. Its temperature compensating characteristics meet requirements of national & state boards of weights & measures. Torsion working stress 40,000-60,000 psi; bending working stress 90,000-100,000 psi.
Elgiloy S J Alloy Durapower Cobenium	Ni 15.0; Fe 15.0; Cr 20.0; Co 40.0; Mo 7.0—This alloy has four names. Used in watches, instruments, cameras & electrical switches. Torsion working stress 125,000 psi; bending working stress 250,000 psi. Suitable for subzero temperatures & up to 750°F, provided torsional strength is kept under 75,000 psi.
Dynavar	Ni 13.0; Fe 17.0; Cr 2.0; Co 42.0; W 2.5—Developed by Hamilton Watch Co. Suitable for subzero & up to 750°F temperatures, provided torsional stresses are kept under 75,000 psi. Used in watches & instruments for springs, diaphragms.

*Only major elements listed

HIGH TEMPERATURE ALLOYS

Alloy	C	Mn	Si	Cr	Ni	Co	Composition Mo	
TYPE: FERRITIC LOW ALLOY & STAINLESS ALLOYS								
422 (Crucible)	0.22	0.65	0.35	12.00	0.70	....	1.00	1.
422-M	0.28	0.84	0.25	12.00	0.20	....	2.25	1.
H-46 (British)	0.15	0.57	0.40	11.50	....	....	0.45	..
Rex-448 (British)	0.15	....	....	11.50	....	....	0.75	..
Uniloy 1409 Cb	0.16	....	....	12.75	....	....	....	..
Greek Ascoloy	0.15	....	....	13.00	2.00	....	....	3.
Moly Ascoloy	0.08	....	....	13.00	....	....	2.00	..
Lapelloy	0.30	....	....	11.50	....	....	2.75	..
Uniloy 1430 W	0.30	....	....	12.25	....	....	....	..
Uniloy 1422 MV	0.23	....	....	11.75	....	....	1.25	..
H-40 (British)	0.23	0.30	0.45	2.70	....	....	....	..
Croloy ½	0.20*	0.50	0.20	0.70	....	....	0.50	..
Croloy 1	0.15*	0.50	0.50	1.00	....	....	0.50	..
Croloy 1¼	0.15*	0.50	0.75	1.25	....	....	0.50	..
Croloy 2	0.15*	0.50	0.50	2.00	....	....	0.50	..
Croloy 2¼	0.15*	0.50	0.50	2.25	....	....	1.00	..
Croloy 3M	0.15*	0.50	0.50	3.00	....	....	0.90	..
Croloy 5	0.15*	0.50	0.50	5.00	....	....	0.50	..
Croloy 5 Ti	0.12*	0.50	0.50	5.00	....	....	0.50	..
Croloy 5 Si	0.15*	0.50	1.50	5.00	....	....	0.50	..
Croloy 7	0.15*	0.50	0.50	7.00	....	....	0.50	..
Croloy 9M	0.15*	0.50	0.50	9.00	....	....	1.00	..
Chromalloy	0.20	....	....	1.00	....	....	1.00	..
Uniloy 14 HV	0.45	....	....	1.00	....	....	0.55	..
17-22 A	0.44	....	0.65	1.25	....	....	0.50	..
17-22 AS	0.30	....	0.65	1.25	....	....	0.50	..
17-22 AV	0.30	....	0.65	1.25	....	....	0.50	..
Thermoid A (Universal-Cyclops)	0.35	0.45	1.00	5.00	....	....	1.40	..
Thermoid B	0.35	0.45	1.00	5.00	....	....	1.70	1.
Thermoid J	0.53	0.35	1.00	5.00	1.50	....	1.75	..
Holcomb 218 (Crucible)	0.35	0.35	1.00	5.00	....	....	1.40	..
Chro-Mow (Crucible)	0.32	0.35	1.00	5.00	....	....	1.35	1.
Peerless J (Crucible)	0.50	0.35	....	1.35	....	....	1.50	2.
Haimo (Crucible)	0.35	0.30	0.75	5.00	....	....	5.00	..
HWD #1 (Firth Sterling)	0.35	....	1.00	5.00	....	....	1.55	1.
HWD #2	0.37	....	1.00	5.25	....	....	1.35	..
HWD #3	0.40	....	1.00	5.25	....	....	1.25	..
Potomac	0.33	....	0.85	5.00	....	....	1.45	1.
Potomac M	0.40	....	1.00	5.00	....	....	1.00	..
HTB-1	1.02	0.35	0.40	1.45	....	....	....	..
HTB-2	0.58	0.30	0.15	4.75	....	....	6.25	..
Hotform No. 1	0.35	0.30	0.90	5.00	....	....	1.40	1.
Hotform No. 2	0.35	0.30	0.90	5.00	....	....	1.30	1.
Hotform No. 3	0.52	0.30	0.90	4.75	....	....	1.40	1.
Hotform V	0.37	0.35	1.00	5.25	....	....	1.25	..
Marvel	0.33	0.20	0.30	3.50	....	....	....	9.
WCC	0.40	0.30	0.30	4.25	....	4.25	0.40	4.
G-192	0.60	8.50	....	22.00	....	....	....	..
AF-183	0.30	18.00	....	12.00	....	....	2.00	..
AF-71	0.30	18.00	....	12.00	....	....	3.00	..
TYPE: CHROMIUM-NICKEL-IRON ALLOYS								
19-9DL	0.30	1.10	0.60	19.00	9.00	....	1.25	1.
19-9DX	0.30	1.00	0.85	19.20	9.00	....	1.50	1.
19-9WX	0.11	....	....	20.50	8.50	....	0.50	1.
Inco "425"	0.04	1.30	0.75	5.50	25.50	....	....	..
Incoloy "901"	0.04	0.45	0.30	13.50	43.25	....	5.90	..
Incoloy	0.04	0.75	0.35	20.50	32.50	....	....	..
Incoloy-T	0.04	0.75	0.35	20.50	32.50	....	....	..
Croloy 15-15N	0.15*	2.00*	0.75*	16.00	15.00	....	1.55	1.
17-14 Cu-Mo	0.12	0.75	0.50	15.90	14.10	....	2.50	..
Timken 16-25-6	0.08*	1.35	0.70	16.00	25.00	....	6.00	..
Timken 16-15-6	0.07*	7.50	0.50	16.00	15.00	....	6.00	..
Discaloy 24	0.03	0.64	0.92	13.10	25.50	....	2.83	..
Croloy 16-8-2	0.10	1.50	0.50	15.00	8.00	....	1.50	..
A-286	0.05	1.35	0.95	15.00	26.00	....	1.75	..
EME	0.10	0.50	0.70	19.00	12.00	....	....	3.
Thermenol	....	....	....	....	....	....	1.70	..
NA-22H (Cast) (Blaw-Knox)	0.50	1.30	1.00	27.00	48.00	....	....	6.
HNM (Crucible)	0.30	3.50	....	18.50	9.50	....	....	..
HTX (Crucible)	0.45	8.50	....	21.00	8.50	....	1.50	..
Cast HTX	0.45	8.00	0.50	21.00	8.00	....	1.50	..
22-4-9 (Armco)	0.45-0.60	7-10	1.00*	20-22	3-5	....	....	..

HIGH TEMPERATURE ALLOYS

Alloy	Composition C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Others	Properties & Applications
TYPE: FERRITIC LOW ALLOY & STAINLESS ALLOYS														
422 (Crucible)	0.22	0.65	0.36	12.00	0.70	....	1.00	1.00	....	....	....	Bal.	V 0.25)	
422-M	0.28	0.54	0.25	12.00	0.20	....	2.25	1.70	....	....	....	Bal.	V 0.50)	
H-46 (British)	0.15	0.57	0.40	11.50	....	....	0.45	....	0.25	....	....	Bal.	V 0.30)	Alloys are higher strength modifications of AISI standard 12% chromium, type 403 stainless. Various grades are used for steam & gas turbine buckets, compressor blades, discs & bolts. Outstanding resistance to stress-corrosion cracking & oxidation. Available in sheet for supersonic aircraft application.
Rex-448 (British)	0.15	....	....	11.50	....	....	0.75	....	0.45	....	....	Bal.	V 0.15)	
Uniloy 1409 Cb	0.16	....	....	12.75	....	....	....	....	0.42	....	....	Bal.	.....)	
Greek Ascoloy	0.15	....	....	13.00	2.00	....	....	3.00	....	....	....	Bal.	.....)	
Moly Ascoloy	0.08	....	....	13.00	....	....	2.00	....	....	....	....	....	.....)	
Lapelloy	0.30	....	....	11.50	....	....	2.75	....	....	....	....	Bal.	V 0.25)	
Uniloy 1430 W	0.30	....	....	12.25	....	....	....	....	....	....	....	Bal.	.....)	
Uniloy 1422 MV	0.23	....	....	11.75	....	....	1.25	....	....	....	....	Bal.	V 0.22)	
H-40 (British)	0.23	0.30	0.45	2.70	....	....	....	....	....	....	....	Bal.	.....	Gas turbine rotors, casings, castings & other uses needing high creep strength up to 600°F.
Croloy ½	0.20*	0.50	0.20	0.70	....	....	0.50	....	....	....	....	....	.....	950°F)
Croloy 1	0.15*	0.50	0.50	1.00	....	....	0.50	....	....	....	....	....	.....	1000°F)
Croloy 1½	0.15*	0.50	0.75	1.25	....	....	0.50	....	....	....	....	....	.....	1100°F) Superheater tubing & pipe with temperature limits shown at left. Also used for oil refinery tubing. Croloy alloys are produced by Babcock & Wilcox. These compositions are available from other producers under different trade names.
Croloy 2	0.15*	0.50	0.50	2.00	....	....	0.50	....	....	....	....	....	.....	1100°F)
Croloy 2¼	0.15*	0.50	0.50	2.25	....	....	1.00	....	....	....	....	....	.....	1100°F)
Croloy 3M	0.15*	0.50	0.50	3.00	....	....	0.90	....	....	....	....	....	.....	1125°F)
Croloy 5	0.15*	0.50	0.50	5.00	....	....	0.50	....	....	....	....	....	.....	1150°F)
Croloy 5 Ti	0.12*	0.50	0.50	5.00	....	....	0.50	....	....	(Ti 4 x C–0.70 Max)		....	.....	1150°F)
Croloy 5 Si	0.15*	0.50	1.50	5.00	....	....	0.50	....	....	....	....	....	.....	1150°F)
Croloy 7	0.15*	0.50	0.50	7.00	....	....	0.50	....	....	....	....	....	.....	1150°F)
Croloy 9M	0.15*	0.50	0.50	9.00	....	....	1.00	....	....	....	....	....	.....	1200°F)
Chromalloy	0.20	....	....	1.00	....	....	1.00	....	....	....	....	Bal.	V 0.12	Sheet metal casing on aviation gas turbine.
Uniloy 14 HV	0.45	....	....	1.00	....	....	0.55	....	....	....	....	Bal.	V 0.30	Same as above & steam & gas turbine bolting.
17-22 A	0.44	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal.	V 0.25	Same as above.
17-22 AS	0.30	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal.	V 0.25	Steam & gas turbine bolting up to 1050°F; sheet metal casing assemblies. Axial-flow compressor blading at 800°F. Aircraft brakes. Compressor discs.
17-22 AV	0.30	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal.	V 0.85	Higher vanadium modification of above.
Thermoid A (Universal-Cyclops)	0.35	0.45	1.00	5.00	....	....	1.40	....	....	....	....	....	V 0.45	Ultra high strength for service up to 1000°F. Airframes, skin, fasteners, rivets, axles, rotors.
Thermoid B	0.35	0.45	1.00	5.00	....	....	1.70	1.35	....	....	....	....	.....	Same as above for ultrahigh strength at 1000°F.
Thermoid J	0.53	0.35	1.00	5.00	1.50	....	1.75	....	....	....	....	....	V 1.00	Ultra high strength up to 1000°F. Tensile strength 230,000 psi at 1000°F; 75,000 psi at 1200°F.
Holcomb 218 (Crucible)	0.35	0.35	1.00	5.00	....	....	1.40	....	....	....	....	....	V 0.45	Aircraft sheet, forgings & fittings for high strength and resistance to softening up to 1000°F.
Chro-Mow (Crucible)	0.32	0.35	1.00	5.00	....	....	1.35	1.35	....	....	....	....	V 0.20	Same as above.
Peerless J (Crucible)	0.50	0.35	....	1.35	....	....	1.50	2.75	....	....	....	....	V 1.35	High strength & hardness retention at temperatures up to 1200°F. For aircraft forgings & springs.
Haime (Crucible)	0.35	0.30	0.75	5.00	....	....	5.00	....	....	....	....	....	V 0.65	Good strength & creep rupture properties at 1000-1100°F for aircraft parts.
HWD #1 (Firth Sterling)	0.35	....	1.00	5.00	....	....	1.55	1.40	....	....	....	....	V 0.30)	High temperature applications under 1000°F. Used mainly for structural parts requiring high strength & shock resistance.
HWD #2	0.37	....	1.00	5.25	....	....	1.35	....	....	....	....	....	V 0.50)	
HWD #3	0.40	....	1.00	5.25	....	....	1.25	....	....	....	....	....	V 1.00)	
Potomac	0.33	....	0.85	5.00	....	....	1.45	1.25	....	....	....	....	V 0.20)	Aircraft sheet, forgings & fittings for high strength and resistance to softening up to 1000°F. Potomac and HTB are Allegheny Ludlum alloys.
Potomac M	0.40	....	1.00	5.00	....	....	1.00	....	....	....	....	....	V 1.00)	
HTB-1	1.02	0.35	0.40	1.45	....	....	....	....	....	....	....	1.00	.....	
HTB-2	0.58	0.30	0.15	4.75	....	....	5.25	....	....	....	....	....	V 0.55)	
Hotform No. 1	0.35	0.30	0.90	5.00	....	....	1.40	1.40	....	....	....	Bal.	V 0.45)	Ultra high strength for service up to 1000°F, airframes, skin, fasteners, rivets, axles, rotors, spindles, etc. Hotform and Marvel compositions made by Vanadium Alloys Steel Co.
Hotform No. 2	0.35	0.30	0.90	5.00	....	....	1.30	....	....	....	....	Bal.	V 0.45)	
Hotform No. 3	0.52	0.30	0.90	4.75	....	....	1.40	1.20	....	....	....	Bal.	.....	
Hotform V	0.37	0.35	1.00	5.25	....	....	1.25	....	....	....	....	Bal.	V 1.05)	
Marvel	0.33	0.20	0.30	3.50	....	....	....	9.75	....	....	....	Bal.	V 0.45)	Ultra high strength material (Vanadium Alloys).
WCC	0.40	0.30	0.30	4.25	....	4.25	0.40	4.25	....	....	....	Bal.	V 2.10)	
G-192	0.60	8.50	....	22.00	....	....	....	....	....	....	....	Bal.	N 0.35)	Nickel-free austenitic grades being developed by Allegheny Ludlum Steel Corp. for parts requiring high strength at elevated temperatures.
A?-153	0.30	18.00	....	12.00	....	....	3.00	....	....	....	....	(V 0.75; N 0.20)		
AF-71	0.30	18.00	....	12.00	....	....	3.00	....	....	....	....	(V 0.75; N 0.30, B 0.20)		
TYPE: CHROMIUM-NICKEL-IRON ALLOYS														
19-9DL	0.30	1.10	0.60	19.00	9.00	....	1.25	1.20	0.40	0.30	....	66.00	.....	Jet engine, gas turbine & turbocharger buckets, bolts, rotors & sheet metal assemblies. Bolting & valve trim for refineries, boilers & steam turbines.
19-9DX	0.30	1.00	0.55	19.20	9.00	....	1.50	1.20	....	0.55	....	66.00	.....	Cb-free version of above.
19-9WX	0.11	....	....	20.50	8.50	....	0.50	1.50	1.50	0.20	....	....	.....	Welding wire.
Inco "425"	0.04	1.30	0.75	5.50	25.50	....	....	....	....	2.40	0.65	63.80	.....	Nonmagnetic retainer rings for central station generators; age-hardenable.
Incoloy "901"	0.04	0.45	0.30	13.50	43.25	....	5.90	....	....	2.50	....	37.35	.....	Aircraft industrial gas turbines; wheels (discs) & components with high strength at 1000-1400°F; bolting. Age-hardenable.
Incoloy	0.04	0.75	0.35	20.50	32.50	....	....	....	....	....	....	45.50	.....	Resistance to oxidation up to 1900°F. Similar to Inconel, but with improved resistance to attack by sulphur, green rot, molten cyanide salts; petrochemical equipment, heat treating fixtures.
Incoloy-T	0.04	0.75	0.35	20.50	32.50	....	....	....	....	1.00	....	44.50	.....	Slightly better elevated temperature properties. Welded sheet metal components.
Croloy 15-15N	0.15*	2.00*	0.75*	16.00	15.00	....	1.55	1.40	1.05	....	....	Bal.	N 0.15*	Superheater tubing, steam piping.
17-14 Cu-Mo	0.12	0.75	0.50	15.90	14.10	....	2.50	....	0.45	0.25	....	Bal.	Cu 3.00	High strength austenitic stainless steel for service up to 1500°F. Aircraft gas turbines, boilers, etc.
Timken 16-25-6	0.08*	1.35	0.70	16.00	25.00	....	6.00	....	....	....	....	50.00	N 0.15	Jet engine, gas turbine & turbosupercharger wheels & buckets. Bolting & sheet metal. Resists sea water. Pickle chains.
Timken 16-15-6	0.07*	7.50	0.50	16.00	15.00	....	6.00	....	....	....	....	55.00	N 0.35	High temperature applications similar to above.
Discaloy 24	0.03	0.64	0.92	13.10	25.50	....	2.83	....	....	1.83	0.16	Bal.	.....	Turbine wheels, structural members, & fasteners in jet engine & gas turbine applications.
Croloy 16-8-2	0.10	1.50	0.50	15.00	8.00	....	1.50	....	....	....	....	Bal.	.....	Welding wire for TP 316 and TP 347 steels.
A-286	0.05	1.35	0.95	15.00	26.00	....	1.75	....	....	2.00	0.20	Bal.	V 0.30	Jet engine & gas turbine buckets, bolts, discs. High strength, nonmagnetic.
EME	0.10	0.50	0.70	19.00	12.00	....	....	3.20	1.20	....	....	63.00	N 0.15	Steam turbine bolting & valve stems.
Thermanol	....	....	....	....	....	....	1.70	....	....	....	16.00	Bal.	V 0.30	Oxidation resistant sheet metal parts.
NA-22H (Cast) (Blaw-Knox)	0.50	1.30	1.00	27.00	48.00	....	....	6.00	....	....	....	Bal.	.....	Strength & oxidation resistance for use at 2200°F. Furnace muffles, fans, retorts, annealing & radiant tubes, baffle support bars, etc.
HNM (Crucible)	0.30	3.50	.....	18.50	9.50	....	....	....	....	....	....	Bal.	P 0.20	Aircraft sheet & bar applications. Compressor blades & sheets for turbine engines; nonmagnetic.
HTX (Crucible)	0.45	8.50	....	21.00	8.50	....	1.50	....	....	....	....	Bal.	P 0.25	Turbine wheels, high temperature sheet for aircraft.
Cast HTX	0.45	8.00	0.50	21.00	8.00	....	1.50	....	....	....	....	Bal.	P 0.22 N 0.20	High strength & rupture properties up to 1600°F.
22-4-9 (Armco)	0.45–0.60	7–10	1.00*	20–23	3–5	....	....	....	....	....	....	Bal.	N 0.35–0.50	Austenitic, nonmagnetic alloy with high strength & hardness up to 1600°F with good scaling resistance. Steam valves & gas turbine parts, nonmagnetic roller bearings & balls.

Alloy	Composition C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Others	Properties & Applications
17-7 PH	0.09*	1.00*	1.00*	16–18	6.5–7.75	....	....	....	....	....	0.75–1.50	Bal.	.....	Hardenable by low temperature heat treatment to 180,000 psi min UTS & 150,000 psi min TS. Airframes, missiles, power plants, etc., up to 900°F.
17-4 PH	0.07*	1.00*	1.00*	15.5–17.5	3–5	....	....	....	0.25–0.45 (Cb + Ta)	....	....	Bal.	Cu 3.0–5.0	High strength, corrosion resistant, & no distortion by low temperature treatment. Valves, shafts, compressor blading, gears, bolting, & structural parts.
AM-350	0.12	1.00	0.50*	16.5	4.50	....	2.80	....	....	....	....	Bal.	N 0.10	Sheet applications, compressor blades. Structural applications in air frames, missiles up to 1000°F.
AM-355	0.12	1.00	0.50*	15.5	4.50	....	2.75	....	....	....	....	Bal.	N 0.10	Bar stock applications similar to above.
N-155 Multimet Alloy (Wrought)	0.16*	....	....	21.00	20.00	20.00	3.00	2.50	....	....	....	Bal.	N 0.20*) Cb + Ta) 1.25*)	Good oxidation & corrosion resistance up to 2000°F. Used where good ductility is a prime factor. Jet engine tail pipes, afterburners & nozzle assemblies.
(Cast)	0.20*	....	....	21.00	20.00	20.00	3.00	2.50	....	....	....	Bal.	N 0.20*) Cb + Ta) 1.25*)	
S-590	0.40	1.50	0.70	20.00	20.00	20.00	4.00	4.00	4.00	....	....	24.00	.....	Wheels & buckets in stationary gas turbines.
S-816	0.38	1.50	0.70	20.00	20.00	43.00	4.00	4.00	4.00	....	....	3.00	.....	Jet engine buckets. High temperature springs. Steam turbine bolting & buckets.
V-36	0.31	0.90	0.50	25.00	20.00	42.00	4.00	2.00	2.20	....	....	3.00	.....	Sheet uses; stressed high temperature parts.
Refractaloy 26	0.03	0.80	1.00	18.00	38.00	20.00	3.20	....	....	2.80	0.20	Bal.	.....	Superior strength at temperatures above 1250°F. Low magnetic response, good corrosion resistance. Buckets, bolts, coiled & flat springs, turbine discs.
Refractaloy 70	0.04	2.00	0.30	20.00	21.00	30.00	5.00	4.20	....	....	....	Bal.	.....	Gas turbine blades & nozzle vanes. Flat & coiled springs. High endurance limit at 1200°F.
Refractaloy 80	0.10	0.60	0.70	20.00	20.00	30.00	10.00	5.00	....	....	....	Bal.	.....	Used extensively for creep testing holders. High strength above 1300°F.
K42B	0.03	0.70	0.70	18.00	42.00	22.00	....	....	....	2.10	0.20	Bal.	.....	High resistance to heat & corrosion. Low creep up to 1350°F. Gas & steam turbine blades, bolts.
TYPE: NICKEL BASE ALLOYS														
Inconel	0.04	0.20	0.20	15.85	76.40	....	....	....	....	....	....	7.20	.....	Resists oxidation up to 2200°F, carburizing & nitriding atmospheres & corrosion. Manifolds, combustion liners, domes, transition liners.
Inconel "702"	0.02	0.05	0.15	15.85	78.00	....	....	....	....	0.60	3.00	0.30	.....	Welded aero sheet metal components; optimum resistance to oxidation over 1800°F.
Nimonic "75"	0.10	0.45	0.45	20.50	77.40	....	....	....	....	0.35	0.15	0.50	.....	Similar to Inconel. Flame tubes, afterburners.
Inconel "M"	0.03	2.25	0.10	16.50	71.00	....	....	....	....	3.10	0.05	7.00	.....	Age-hardenable Inconel. High strength & resistance to oxidation & leaded fuels. Valves for aviation piston type engines.
Inconel "W"	0.03	0.55	0.20	15.15	74.70	....	....	....	....	2.35	0.60	6.40	.....	Age hardenable Inconel, with high strength & oxidation resistance. Welded sheet metal components such as afterburners.
Inconel "X"	0.04	0.70	0.30	15.15	72.80	....	....	....	0.85	2.55	0.80	6.75	.....	Age hardenable Inconel. Oxidation resistance, high strength up to 1500°F. Blades, rotors, bolting, welded sheet metal components.
Inconel "X," Type "550"	0.04	0.55	0.35	15.00	72.60	....	....	....	0.90	2.35	1.10	6.85	.....	Inconel "X" with increased hardener.
Nimonic "80A"	0.05	0.55	0.20	20.50	74.50	....	....	....	....	2.45	1.30	0.50	.....	Rotor turbine blades—up to 1400°F, stator blades.
Nimonic "90"	0.05	0.50	0.20	20.50	57.00	17.00	....	....	....	2.60	1.65	0.50	.....	Rotor turbine blades—up to 1550°F.
Inconel "700"	0.14	0.10	0.25	15.00	46.10	29.00	3.25	....	....	2.20	3.20	0.65	.....	Rotor turbine blades—up to 1650°F.
Hastelloy Alloy B (Wrought)	0.05*	1.00*	1.00*	1.00*	Bal.	2.50*	28.00	....	....	....	....	5.00	V 0.60*	Outstanding resistance to hot hydrochloric acid, wet hydrogen chloride gas & other reducing agents. Oxidation rate in air is low enough for use up to 1400°F.
(Cast)	0.12*	1.00*	1.00*	1.00*	Bal.	2.50*	28.00	....	....	....	....	5.00	V 0.60	
Hastelloy Alloy C (Wrought)	0.08*	1.00*	1.00*	15.50	Bal.	2.50*	16.00	4.50*	....	....	....	5.50	V 0.35*	Good all around high-temperature properties. Particularly for parts highly stressed or subjected to repeated thermal shock at 1600-1800°F. Withstands strong oxidising conditions, sea water and acetic, formic, phosphoric, sulphurous & sulphuric acids.
(Cast)	0.12*	1.00*	1.00*	16.50	Bal.	2.50*	17.00	4.50	....	....	....	5.50	V 0.35*	
Hastelloy Alloy D (Cast)	0.12*	1.00	9.00	1.00*	Bal.	....	....	....	....	....	....	2.00*	Cu 4.00*	Used for handling boiling sulphuric acid in all concentrations.
Hastelloy Alloy F (Wrought)	0.05*	2.00*	1.00*	22.00	Bal.	2.50*	6.50	1.00*	....	....	....	13.00	Cb + Ta 2.50* (Ta 0.50 min)	Good high-temperature properties but primarily used to resist corrosion in sulphite pulp digesters.
(Cast)	0.12*	2.00*	1.00*	22.00	Bal.	2.50*	6.50	1.00*	....	....	....	13.00	Cb + Ta 2.50 (No Ta min)	Wrought alloy is also available in vacuum melted form.
Hastelloy Alloy R-235 (Wrought)	0.16*	1.00*	1.00*	14.00–17.00	Bal.	2.50*	4.5–6.5	....	....	2.25–2.75	1.75–2.25	9.00–11.00	.....	Vacuum-melted, precipitation-hardening alloy with good stress-rupture properties up to 1750°F.
GMR-235 (Cast)	0.15	0.25*	0.60*	15.50	Bal.	....	5.25	....	....	2.00	3.00	10.00	B 0.05	Has excellent stress-rupture properties at high stresses up to 1700°F. Vacuum melted.
Hastelloy Alloy W (Wrought)	0.05*	1.00*	1.00*	6.00*	Bal.	2.50*	28.00	....	....	....	....	5.00	V 0.60*	First used as welding wire for joining dissimilar materials but is now coming into its own as high-temperature alloy.
Hastelloy Alloy X (Wrought)	0.15*	1.00	1.00*	22.00	Bal.	2.50*	9.00	1.00*	....	....	....	18.50	.....	Good scale resistance to 2300°F. Short-time tensile properties to 1800°F similar to Multimet alloy.
(Cast)	0.20*	1.00	1.00*	22.00	Bal.	2.50*	9.00	1.00*	....	....	....	18.50	.....	
Waspaloy	0.05	....	....	19.50	Bal.	13.50	4.00	....	....	3.00	1.25	2.00*	.....	Gas turbine buckets. Largely vacuum melted.
Udimet 500	0.15*	0.75*	0.75*	20.00	Bal.	13.00	4.00	....	....	3.00	2.75	4.00*	.....	Gas turbine components. High strength at elevated temperatures. Vacuum melted.
Thetalloy (Cast)	....	2.50	....	25.00	Bal.	12.50	3.00	7.00	....	....	....	....	.....	Gas turbine diaphragms.
M-252 (GE)	0.10	1.00	0.70	19.00	54.00	10.00	10.00	....	....	2.50	0.75	2.00	.....	Gas turbine buckets, torque rings. Vacuum melted.
Illium G	0.25	0.35	0.90	22.00	58.50	....	6.00	....	....	....	....	6.00	Cu 6.00	High temperature & corrosion resistant applications.
Illium R	0.07	0.40	0.11	22.00	64.00	....	5.00	....	....	....	....	6.00	Cu 2.50	High temperature & corrosion resistant applications.
TYPE: COBALT BASE ALLOYS														
Haynes Stellite-21 Vitallium Type Alloy (Cast)	0.30*	1.00*	1.00*	27.00	2.75	Bal.	5.50	....	....	....	....	3.00*	.....	Resists oxidising & reducing atmospheres up to 2100°F. Excellent strength from subzero to elevated temperatures. Also good thermal shock properties.
Haynes Stellite-30 (422-19) (Cast)	0.50*	1.00*	1.00*	26.00	15.00	Bal.	6.00	....	....	....	....	2.00*	.....	Excellent creep properties at 1600°F. Modulus of elasticity does not drop off rapidly & endurance properties are good. For use up to 2100°F.
Haynes Stellite-31 (X-40) (Cast)	0.55*	1.00*	1.00*	25.50	10.50	Bal.	....	7.50	....	....	....	2.00*	.....	Excellent high stress-rupture, endurance & creep properties. Good oxidation resistance to 2100°F.
Haynes No. 36 (L251) (Cast)	0.45*	1.50*	1.00*	18.50	10.00	Bal.	....	15.00	....	....	....	2.00*	B 0.05*	Excellent creep & stress-rupture properties; good hot ductility at rupture. Properties improved by aging for 16 hr at 1350°F.
Haynes No. 25 (L-605) (Wrought)	0.15*	1–2	1.00*	20.00	10.00	Bal.	....	15.00	....	....	....	3.00*	.....	Good high-temperature properties without age-hardening. Resists oxidation up to 2000°F. Used for nozzle partitions & afterburner assemblies.
WF-11 (Crucible)	0.15	1.50	0.50	20.00	10.00	Bal.	....	15.00	....	....	....	3.00*	.....	Afterburner sheet, turbine rings, nozzle vanes in turbine engines—6000 psi for 100 hr at 1800°F.
GE Alloy 1570	0.20	....	....	20.00	28.00	Bal.	....	6.50	....	4.00	....	....	.....	Gas turbine buckets & high temperature sheet metal parts. Vacuum melted.

TYPE: MOLYBDENUM BASE ALLOYS

Unalloyed Mo	Electric and electronic parts; rocket nozzles; glass melting furnace parts.
0.3% Cb Alloy 0.5% Ti Alloy 1.0% V Alloy 2.0% W Alloy	Piercer points; experimental gas turbine buckets and guide vanes. Useful strength at temperatures above 1600°F greater than that of any other commercially available material. Must be protected against oxidation at elevated temperatures. Stress-relieved 0.5% Ti alloy has 100-hr stress-rupture strength of 66,000 psi at 1600°F; 53,000 psi at 1800°F and 34,000 psi at 2000°F. Alloys shown are commercially available from Climax Molybdenum Co.

*Indicates maximum.

Note: This chart does not include the AISI grades of stainless and heat resistant steels, many of which are used in high temperature applications.

CAST HIGH ALLOYS

Corrosion & Heat Resistant

ACI Designation	Equiv. (Wrought)	Nominal Composition — Outstanding Properties & Typical Uses
CA-15	410	C 0.15 max; Cr 11.5-14; Ni 1.0 max; Fe bal.—Hardenability, 144 to 400 BHN. Good atmospheric corrosion resistance. Pump casings, bushings & liners, impellers, shafts, turbine blades, stuffing boxes, valve bodies & trim, fittings, furnace burner tips & pilot cones.
CA-40	420	C 0.20-0.40; Cr 11.5-14; Ni 1.0 max; Fe bal.—Hardenability, up to 500 BHN. Corrosion resistance same as CA-15. Choppers, cutting blades, cylinder liners, pump parts, steam turbine parts, molds, dies.
CB-30	431	C 0.30 max; Cr 18-22; Ni 2.0 max; Fe bal.—Resists nitric acid, alkali & many organic chemicals. Good machinability. Furnace brackets & hangers, pump parts, rabble arms, tube supports, valve bodies & parts.
CC-50	446	C 0.50 max; Cr 26-30; Ni 4.0 max; Fe bal.—Magnetic, good machinability; resists dilute sulphuric acid, mixed nitric & sulphuric acids & oxidizing acids. Bushings, cylinder liners, pump casings & impellers, valve bodies & seats.
CE-30	...	C 0.30 max; Cr 26-30; Ni 8-11; Fe bal.—Better strength & ductility than CC-50; useful where castings cannot be heat treated. Resists sulphurous acid & sulphites. Process industry equipment such as digester fittings, fractionating towers, pipings, pump bodies & casings, valve bodies & parts.
CF-4	304 L	C 0.040 max; Cr 17-21; Ni 8-12; Fe bal.—Good ductility & impact strength. Corrosion resistance better than CF-8. Useful as alternate to CF-8C for field welding applications.
CF-8	304	C 0.08 max; Cr 18-21; Ni 8-11; Fe bal.—High impact strength at low temperatures. Resists strong oxidants such as boiling nitric acid. Autoclaves, blast furnace bushings, filter press plates, hardware, headers & heating coils, pump parts, spray nozzles, valve parts.
CF-20	302	C 0.20 max; Cr 18-21; Ni 8-11; Fe bal.—High ductility & impact strength. Satisfactory in many oxidising environments. Cylinder liners, pumps, return bends, rolls, circuit breaker parts, valve parts.
CF-4M	316L	C 0.04 max; Cr 17-21; Ni 9-13; Mo 2.0-3.0; Fe bal.—Similar to CF-8M but with better corrosion resistance in severe service.
CF-8M	316	C 0.08 max; Cr 18-21; Ni 9-12; Mo 2.0-3.0; Fe bal.—Used up to 1600°F—ductile & strong. Resists reducing solutions & pitting corrosion in sea water. Agitators, evaporator parts, jet engine components, spray nozzles, high pressure steam valves.
CF-12M	316	C 0.12 max; Cr 18-21; Ni 9-12; Mo 2.0-3.0; Fe bal.—Preferred over CF-8M for operating temperatures above 1200°F; corrosion resistance not quite as good as CF-8M. Agitators, evaporator parts, jet engine components, spray nozzles, high pressure steam valves.
CF-8C	347	C 0.08 max; Cr 18-21; Ni 9-12; Cb 8xC min, 1.0 max or Cb-Ta 10xC min, 1.35 max; Fe bal.—Suitable for field welding. Corrosion resistance similar to CF-8. Aircraft shroud assemblies, autoclaves, chemical tubing, fittings, jet engine parts, marine fittings.
CF-16F	303	C 0.16 max; Cr 18-21; Ni 9-12; Mo 1.5 max; Se 0.20-0.35; P 0.17 max; Fe bal.—Improved machinability, good welding characteristics. Corrosion resistance inferior to CF-20, but adequate for many purposes. Bearings, bushings, fittings, pump & machinery parts.
CF-16Fa	303	C 0.16 max; Cr 18-21; Ni 9-12; S 0.20-0.40; Mo 0.40-0.80; Fe bal.—Same as CF-16F.
CH-20	309	C 0.20 max; Cr 22-26; Ni 12-15; Fe bal.—More ductile than CE-30 but not as strong; stronger than CF-8 but not as ductile. Resists hot dilute sulphuric acid. Digester fittings, roasting equipment, valves.
CK-20	310	C 0.20 max; Cr 23-27; Ni 19-22; Fe bal.—Withstands elevated temperatures, resists dilute sulphuric acid. Digesters, filter press parts, fittings, jet engine parts, pumps, valves.
CN-7M	...	C 0.07 max; Cr 18-22; Ni 21-31; Mo-Cu; Fe bal.—Good machining & fair welding properties, nonmagnetic. Resists: Sulphuric acid, reducing chemicals, dilute hydrochloric acid, hot chlorides & nitric acid. Filter parts, heat exchanger parts, pickling rolls, hooks & racks.
HA	...	C 0.20 max; Cr 8-10; Mo 0.90-1.20; Fe bal.—Maximum use temperature: 1300°F. Fan blades for hot gases, trunnion for glass rolls.
HC	446	C 0.50 max; Cr 26-30; Ni 4.0 max; Fe bal.—Maximum use temperature: 1200°F with moderately heavy loading; 1900°F with light loading. Used in sulphur atmosphere when heavy loading is not involved; in ore roasting furnaces for parts such as rabble arms and blades.
HD	327	C 0.50 max; Cr 26-30; Ni 4-7; Fe bal.—Properties & uses same as type HC, with greater strength at elevated temperatures. Useful in sulphur atmospheres. Ore roasting furnaces parts, salt pots, grate bars.
HE	...	C 0.20-0.50; Cr 26-30; Ni 8-11; Fe bal.—Maximum use temperature: 2000°F. Good corrosion resistance & ductility; moderate strength at elevated temperatures. Stands sulphur atmospheres.
HF	302B	C 0.20-0.40; Cr 19-23; Ni 9-12; Fe bal.—Maximum use temperature: 1600°F. Good corrosion resistance in the range 1200-1600°F. Oil refineries for tube supports & beams; cement mill parts, ore roasting furnace parts, heat treating furnaces.
HH	309	C
HI		C
HK	310	C
HL	...	C
HN	...	C
HT	330	C
HU	...	C
HW	...	C
HX	...	C

NOTES:

1. Most of the standard
Society for Testing M
A 217-55, A 351-52T,
2. Cast alloy chemical c
should use cast alloy

VACUUM MELTED METALS

Alloy	Source—See Key	Nominal Composition — Properties & Typical Uses
M-252	(1)*, (2), (3), (4), (5), (6), (7)	C 0.15; Cr 19.0; Ni 56.5; Mo 9.75; Co 10.0; Al 1.10; Ti 2.50; Fe 1.25 — Higher stress rupture & endurance limit with better ductility than air melted alloy. Jet engine & gas turbine buckets, discs, bolts & other hot area parts.
GE-1570	(1)*, (2), (3), (4), (6), (7),	C 0.15; Cr 20.0; Ni 29.0; Co 37.50; Ti 4.30; Fe 1.40; W 7.30 — High temperature areas in heat engines, same as above.
AISI 52100	(1)*, (2), (4), (6), (7)	C 1.00; Mn 0.35; P 0.025; S 0.025; Si 0.27; Cr 1.50; Fe bal — Lower nonmetallic content, higher fatigue strength, better surface finish, lower frictional torque. Inner & outer races for instrument bearings; thrust bearings for main shaft in jet engines. Rolls for thin metal strips.
HTB-1 MHT	(1)*, (6)	C 1.03; Mn 0.35; Cr 1.45; Al 1.0 — High temperature bearings for jet engines.
AISI 51100	(1)*, (2), (6), (7)	C 1.00; Mn 0.35; P 0.025; S 0.025; Si 0.27; Cr 1.00 — Tool steel for bearings; properties similar to 52100.
A-286	(1)**, (4)*, (5), (6), (7)	C 0.06; Mn 1.50; Si 0.70; Cr 14.80; Ni 26.50; Mo 1.30; Ti 2.0; Fe 53.50; V 0.30 — High stress rupture & endurance limit; better transverse ductility. Wheels for turbojet engines, turbine case applications. Excellent hot workability of large cross sections.
Waspaloy	(1)†, (2), (3), (4), (5), (6), (7), (8)	C 0.08; Cr 19.50; Ni 57.0; Mo 4.30; Co 13.50; Al 1.30; Ti 3.10; Fe 1.25 — Higher stress rupture & endurance limit, better ductility. Blades for turbojet engines. Specification for grade "Super" calls for vacuum melting.
Udimet 500	(1), (2), (3), (4), (5)	C 0.10; Cr 19.0; Mo 4.0; Ti 3.0; Al 3.0; Co 19.0; Ni bal — Applications where high strength at high temperature is required. Jet engine & gas turbine buckets, discs, & bolts.
Inductovac 700 (Inco 700)	(4)	C 0.14; Cr 15.0; Ni 55.0; Mo 3.0; Co 30.0; Al 3.10; Ti 2.55; Fe 1.50 — Jet engine & gas turbine buckets, discs, bolts, etc.
GMR-235	(1)†, (2), (3), (4), (5), (6), (7), (8)	C 0.15; Cr 16.0; Ni 63.0; Mo 5.30; Al 3.20; Ti 2.20; Fe 10.0; B 0.075 — High temperature areas in jet engines.
Inductovac MCB	(4)	C 0.70; Si 1.05; Cr 3.50; Mo 5.50 — High temperature bearings.
Haimo	(1)*, (2), (6), (7)	C 0.55; Cr 4.75; Mo 5.25; Mn 0.30; V 0.55; Si 1.12; Fe bal — Good fatigue strength for high temperature service to 500° F. Thrust bearings for main shaft of jet engines.
HTB-Z		
X-40	(2), (5)	Ni 10.0; Fe 1.0 max; Cr 23.0; W 7.0; Co bal — High temperature areas in jet engines.
Discaloy	(1)**, (4)*,	C 0.06; Mn 0.80; Cr 13.50; Ni 26.0; Mo 3.0; Ti 1.67; Fe 54.0 — Higher hot stress rupture, endurance limit & better ductility. Wheels for turbojet engines.
Hastelloy R-235	(1)*, (3), (4)	C 0.16 max; Mn 1.0 max; Si 1.0 max; Al 1.75-2.25; Ti 2.25-2.75; Fe 9.0-11.0; Mo 4.5-6.5; Cr 14.0-17.0; Co 2.5 max; Ni bal — High temperature alloy for jet aircraft combustion cans, afterburners, blading, etc.
Hastelloy Alloy F	(3)	C 0.03 max; Mn 1.0-2.0; Si 1.0 max; Cb + Ta 1.75-2.5; Ta 0.50 min; Fe 17.5; Mo 5.5-7.5; Cr 21.0-22.0; Co 2.5 max; W 1.0 max; Ni bal — Corrosion resistant alloy used in sulphite pulp digesters for paper.
Hastelloy X	(1)*, (3)	C 0.15; Cr 22.0; Ni 45; Mo 9.0; Fe bal — Flange rings in hot end of jet engines.
AISI-M 50	(1)*, (2), (6), (7)	Mn 0.35; Ni 0.10; W 0.25; Co 0.25; Mo 4.25; V 1.0; Cr 4.0; Fe bal — Bearings, hot work die steels.
AISI-M 2	(1)*, (2), (4), (6), (7)	C 0.85; W 6.4; Cr 4.1; V 1.9; Mo 5.0; Fe bal — High speed steel suitable for high temperature bearings, taps, drills, chasers, broaches, milling cutters, etc.
AISI-D2	(1)*, (2), (4), (7)	C 1.55; Si 0.35; Mn 0.25; S 0.03 max; P 0.03 max; Cr 12.0; V 0.80; Fe bal — Cold work die steel suitable for gages, thread rolling dies, drawing dies, coining dies & rolls.
M-308	(1)*, (2), (4)**, (6)	C 0.08 max; Mn 0.60 max; Si 0.60 max; Cr 13.5-15.0; Ni 21.0-24.0; Mo 3.0-4.0; Al 0.45; Zr 0.15-0.35; Fe bal — Applications similar to A-286 but used at higher temperatures. Jet engine & gas turbine buckets, bolts, discs & sheet metal assemblies.
Crocar	(1)*, (2), (7)	C 2.20; Cr 12.0 — Similar to D-2 but greater wear resistance.
AISI-M-10	(1)*, (2), (4), (6), (7)	C 0.87; Mn 0.30; Si 0.30; Cr 4.0; Mo 7.9; Fe 84.5; V 2.0 — High speed steel suitable for high temperature bearings, taps, drills, chasers, broaches, milling cutters, etc.
AISI-T 15	(7)	C 1.50; W 13.0; Cr 4.20; V 5.0; Co 5.0 — High speed steel with good wear resistance. Used for high temperature bearings, cutting & forming tools.
Hotform #2	(2), (7)	C 0.30; Si 0.9; Cr 5.0; Mo 1.30; V 0.4 — Hot work die steel for thread rolling dies, gages, rolls.
Potomac M	(1)*,	C 0.40; Si 1.0; Cr 5.0; Mo 1.00, V 1.0 — Hot work die steel.
AMS-6260E	(2), (6), (7)	C 0.1; Ni 3.20; Cr 1.20; Mn 0.55; Si 0.25 — Gear alloy.
S-816	(1)*, (7)	Co 43.0; Cr 20.0; Ni 20.0; Mn 1.50; Mo 4.0; W 4.0; Cb + Ta 4.0 — High temperature alloy.
AEM-5765		

Alloy	Source—See Key	Nominal Composition
SAE-4340	(1)*, (2), (6), (7)	C 0.40; Mn 0.70; P 0.40; S Si 0.30; Ni 1.80; Cr 0.80; Mo Fe bal
AISI 6150	(1)*, (2), (4), (6), (7)	C 0.52; Mn 0.80; Si 0.30; Cr Fe 97.5; V 0.21
Armco 17-4 PH	(8)	C 0.07 max; Mn 1.0; Si 1.0; Cr 15.5-17.5; Ni 3.6-5.0; Mo 0.5 P 0.04 max; S 0.03 max; Cu 3. Cb 0.25-0.45; Fe bal
AISI 410 AMS 5350C	(8)	C 0.15 max; Mn 1.0 max; Si 1.0 Cr 11.5-13.5; Ni 0.5 max; Mo 0.50 max; Cu 0.50 max; P 0.04 max; S 0.03 max; Fe b
AISI 310	(8)	C 0.25 max; Mn 2.0 max; Si 1.5 Cr 24.0-26.0; Ni 19.0-22.0; P 0.04 max; S 0.03 max; Fe b
Magnetic alloy	(8)	C 0.72-0.78; W 4.5-5.5; Si 0.2 Cr 3.75-4.0; Co 0.37-0.41; Fe b
AMS-5382 PWA-651	(8)	C 0.35-0.45; Mn 2.00-3.00; Si 1.00 max; Cr 23.5-26.5; Mo 2. Fe 5.0 max; Co 10.0-15.0; W 6. S 0.03 max; Ni bal
AISI-440C	(1)*, (2), (4), (6), (7)	C 1.05; Mn 0.375; Si 0.375; Cr Mo 0.50; Fe 80.50
AISI-347	(1)*, (2), (4), (6), (7)	C 0.08; Mn 1.90; Cr 19.75; Ni Fe 67.50; Cb + Ta 0.90
Lapelloy	(1)**, (4)*, (7)	C 0.030; Cr 11.50; Mo 2.75; V Fe bal
Inductovac 18-15B	(4)	C 0.01; Mn 1.20; Cr 18.0; Ni Fe 65.0; B 0.80
Inductovac 18-8B Ferrovac 304B	(4), (6)	C 0.06; Cr 19.0; Ni 9.5; Fe B 2.15
Thermenol	(1), (4)	C 0.03; Mo 3.30; Al 15.4; Fe
Alfenol	(4)	C 0.01; Al 15.85; Fe 84.0
Nimonic 80A	(2), (4), (6)	C 0.06; Cr 20.50; Ni 74.50; Al Ti 2.36
Nimonic 90	(2), (4), (6)	C 0.06; Cr 19.0; Ni 54.0; Co Al 1.7; Ti 2.7
AISI-T1	(1)*, (4), (7)	Cr 4.0; W 18.0; V 1.10; Fe bal
AISI-M1	(1)*, (2), (4), (7)	C 0.75; Mn 0.30; Si 0.30; V Cr 3.75; Mo 8.55; Fe 83.50; V
Virgo	(4)	C 0.83; Mn 0.30; Si 1.15; Cr Mo 5.25; Fe 87.50; V 0.55
BHT	(4)	C 0.82; Cr 4.0; Mo 4.20; Fe V 0.95
AISI-A 2	(1)*, (4), (7)	C 1.0; Mn 0.60; Si 0.20; Cr Mo 1.10; Fe 91.50; V 0.25
Ferrovac Airdie 150	(6)	C 1.50; Cr 11.50; Mo 0.80; V Fe bal
Cuprovac E (Copper)	(2), (6)	99.98 + per cent copper
Nivac P (Nickel)	(2), (6)	99.92 + per cent nickel
Ferrovac E (Iron)	(2), (6)	99.92 + per cent iron

KEY TO SOURCE:
(1) Allegheny Ludlum Steel Corp., Pittsburgh.
(2) Metallurgical Products Dept., General Electric Co., Detroit.
(3) Haynes Stellite Co., New York.
(4) Universal-Cyclops Steel Corp., Bridgeville, Pa.
(5) Utica Drop Forge & Tool Corp., Utica, N. Y.
(6) Vacuum Metals Corp., Syracuse, N. Y.
(7) Vanadium-Alloys Steel Co., Latrobe, Pa.
(8) Cannon-Muskegon Ins. Muskegon, Mich.

ht)	Nominal Composition Outstanding Properties & Typical Uses
	C 0.20-0.50; Cr 24-28; Ni 11-14; Fe bal.—Maximum use temperature: 2000°F. High strength & oxidation resistance at elevated temperatures. Depending on composition, the alloy can be partially ferritic or fully austenitic. Tube supports & beams in oil refineries, ore roasting furnace parts & heat treating parts.
	C 0.20-0.50; Cr 26-30; Ni 14-18; Fe bal.—Maximum use temperature: 2150°F. Cast retorts for magnesium production.
	C 0.20-0.60; Cr 24-28; Ni 18-22; Fe bal.—Maximum use temperature: 2100°F. Resists hot gas corrosion better than type HH. Not recommended where severe thermal shock is involved. Used where high creep strength is needed; jet engines, gas turbines, furnace parts.
	C 0.20-0.60; Cr 28-32; Ni 18-22; Fe bal.—Maximum use temperature: 1800°F. Good corrosion resistance in sulphur atmospheres. Gas dissociation equipment, fixtures.
	C 0.20-0.50; Cr 19-23; Ni 23-27; Fe bal.—Good high temperature strength & corrosion resistance in chemically reactive media. Brazing fixtures for use up to 2060°F.
	C 0.35-0.75; Cr 13-17; Ni 33-37; Fe bal.—Maximum use temperature: 2100°F in oxidizing and 2000°F in reducing atmospheres. Excellent service life where subject to rapid heating & cooling. Heat treating furnace parts such as rails, rolls, discs, chains, boxes, pots & fixtures subject to cyclic heating. Also used for glass rolls, enameling racks.
	C 0.35-0.75; Cr 17-21; Ni 37-41; Fe bal.—Strength & corrosion resistance at high temperatures; similar to HT. Used where improved resistance to hot gas corrosion is required.
	C 0.35-0.75; Cr 10-14; Ni 58-62; Fe bal.—Maximum use temperature: 2050°F in oxidizing, 1900°F in reducing atmospheres. Excellent for severe service at high temperatures involving cyclic heating or thermal shock. Hearths, muffles, retorts, trays, boxes, burner parts, enameling fixtures, quenching fixtures, molten lead containers.
	C 0.35-0.75; Cr 15-19; Ni 64-68; Fe bal.—Maximum use temperatures same as HW, but better in resistance to reducing gases containing sulphur at 1800°F. Used in contact with tempering & cyaniding salts. Same applications as HW, improved resistance to hot gas corrosion.

tandard grades listed are covered for general applications by American ting Materials specifications A 296-55 and A 297-55. ASTM specifications -52T, A 362-52T, B 190-50 & B 207-50 also apply to some of the grades. nical composition ranges *are not the same* as the wrought alloys. Buyers alloy designations for proper identification of castings.

ion	Properties & Typical Uses
.40; S 0.40; 50; Mo 0.25;	Higher endurance limit & higher transverse ductility. Superstrength structural parts, air frame components, high strength gears.
30; Cr 0.95;	Higher endurance limit, lower nonmetallic inclusions. Aircraft valve springs, fasteners.
1.0; Mo 0.50 max; ; Cu 3.0-5.0;	Castings for high strength, corrosion and heat resistance.
; Si 1.0 max; t; nax; ; Fe bal Si 1.5 max; 0;	Castings where moderate heat and corrosion resistance are required with high strength and good impact properties.
; Fe bal Si 0.20-0.35; ; Fe bal 0; ; Mo 2.0-4.0; ; W 6.0-8.0;	Castings for high temperature service under corrosive conditions.
	Castings and wrought forms for magnetic applications.
	Castings for high temperature aircraft service.
75; Cr 17.25; 75; Ni 9.90; 90 .75; V 0.25;	Lower nonmetallic inclusions; stainless instrument bearings. Fine finish & high strength rolls. Crack-free core wire for welding & miscellaneous uses. Jet engine parts in cyclical heat zone. Gas turbine compressor discs & parts. Flange rings.
.0; Ni 15.0;	Atomic energy applications, such as neutron control rods.
5; Fe 69.0;	Atomic energy applications such as neutron control rods.
4; Fe 81.27 0 50; Al 1.20;	Magnetic & heat resistant uses. Magnetic & heat resistant uses. Jet engine & gas turbine buckets, discs, bolts, etc.
0; Co 20.0;	Jet engine & gas turbine buckets, discs, bolts, etc.
Fe bal 30; V 1.15; .50; W 1.60 15; Cr 4.75; 55	Tool steel for high temperature bearings. Tool steel for high temperature bearings. Tool steel for high temperature bearings.
20; Fe 9.0;	Tool steel for high temperature bearings.
0; Cr 5.25; 25 80; V 0.20;	Tool steel for gages and rolls. Low nonmetallic inclusions. Used for jewelers rolls for better surface finish. Higher purity, lower gas content, lower nonmetallics, lower high vapor pressure elements. Vacuum tubes in electronics industry, transmitting tubes, magnetrons. Properties similar to above. Vacuum tubes for electronic industry, hydrogen thyratrons, magnetrons, etc. Properties similar to above. Magnetic alloys, vacuum tubes for electronics industry, magnetrons, klystrons, etc.

*All alloys are induction vacuum melted unless source is marked with asterisk, which indicates a consumable electrode melted grade is also available.

**Indicates only consumable electrode melted grade is available.

†Research indicates that combination induction vacuum, consumable vacuum may be advisable for improved hot workability.

COPPER ALLOYS

Wrought alloys not listed in the Copper & Brass Research Association's Manual of Standard Alloys

Name & Producer	Nominal Composition	Forms & Applications
High-Thermo (Mod. Electrolytic Tough Pitch) Phelps Dodge Copper Products Corp.	Cu 99.90 (Plus small quantity of an element added to increase resistance to annealing.)	Wire, bar, commutator section stock—High conductivity electrical applications, as in transmission lines, bus bars, commutator segments, where greater retention of hard tensile is desired at temperatures that normally soften electrolytic copper.
Tellurium Copper Chase Brass & Copper Co.	Cu 99.50; Te 0.50	Rod—Screw machine & other parts requiring a high conductivity.
Tellurium Copper-127 American Brass Co.	Cu 99.50; Te 0.50	Rod, bar, die-pressed forgings—Gas-cutting torch & welding tips.
Chromium Copper-999 American Brass Co.	Cu 99.05; Si 0.10; Cr 0.85	Sheet, strip, plate, wire, rod, bar—Switches, circuit breakers, contact points on resistance welding electrodes, grid supports, vacuum tubes.
Hitenso—961 (Cadmium Copper) American Brass Co.	Cu 99.00; Cd 1.00	Sheet, strip, plate, wire, rod, bar — Electrical conductors, electrodes for resistance welding.
Phosnic Bronze (Nickel-Phosphorus Bronze) Chase Brass & Copper Co.	Cu 98.65; Ni 1.10; P 0.25	Rod—Rivets, screws, springs, electrical parts.
Hitenso—965 (Cadmium Bronze) American Brass Co.	Cu 98.60; Sn 0.60; Cd 0.80	Wire, rod, bar—Wire & cable for electrical conductors.
Telnic Bronze (Nickel-Phosphorus Bronze) Chase Brass & Copper Co.	Cu 98.15; Ni 1.10; Te 0.50; P 0.25	Rod—Forgings & screw machine parts requiring high strength, good conductivity.
Everdur—1012 (Leaded Silicon Bronze) American Brass Co.	Cu 95.60; Pb 0.40; Si 3.00; Mn 1.00	Rod—Screw machine products.
Calsun Bronze American Brass Co.	Cu 95.50; Sn 2.00; Al 2.50	Wire—Wire & cable for electrical conductors.
Ambraloy—901 (Aluminum Bronze, 5%) American Brass Co.	Cu 95.00; Al 5.00	Tube, rod, bar, sheet, strip, plate, wire—Condenser & heat exchanger tubes, foreign coinage, architectural decoration to imitate gold.
Ambronze—474 American Brass Co.	Cu 94.97; Zn 4.00; Sn 1.00; P 0.03	Sheet, strip, plate—Electric switch parts & spools.
Brazing Bronze—222 Olin Mathieson Chemical Corp.	Cu 93.00; Zn 4.70; Fe 2.30	Sheet, strip—Retains fine grain size up to about 1600-1700° F. Used for furnace brazing, electrical applications such as circuit breaker arms, terminals.
Trembronze (Tin Brass) Miller Co.	Cu 92.00; Sn 2.00; Zn 6.00	Strip—General spring & contact applications in electrical & hardware field.
Ambraloy—928 (Aluminum Bronze, 8%) American Brass Co.	Cu 92.00; Al 8.00	Sheet, strip, plate, wire, rod, bar—Valve stems, coins, medallions, plaques.
Duronze—707 (Aluminum Silicon Bronze) Bridgeport Brass Co.	Cu 91.00; Al 7.00; Si 2.00	Rod, bar—Valve stems & parts, wire & cable connector parts, bolts & nuts, hot forged parts, marine hardware, gears, pinions. Good corrosion resistance.
Everdur—1014 (Aluminum Silicon Bronze) American Brass Co.	Cu 90.75; Al 7.25; Si 2.00	Rod—Screw machine parts, die-pressed forgings.
High Strength Commercial (Bronze 286) American Brass Co.	Cu 90.25; Zn 6.90; Pb 1.75; P 0.10; Ni 1.00	Rod, bar, tube—Pole line hardware & other parts subject to outdoor exposure.
Ampco Grade 8 (Aluminum Bronze D) Ampco Metal Inc.	Cu 90.00; Al 7.00; Fe 2.25	Sheet, plate, extruded rod, tube, pipe, shapes—Mechanical & processing fabrications, conveyors, liners, heads, slides, gibs & wear strips.
Lubaloy—X50 (Tin Brass) Olin Mathieson Chemical Corp.	Cu 90.00; Zn 8.25; Sn 1.75	Sheet, strip—Radio tube socket contacts, fuse clips, contact springs, lock washers, solderless connectors, jewelry, coins, electric fan blades, medallions.
Lubaloy—64 (Tin Brass) Olin Mathieson Chemical Corp.	Cu 90.00; Zn 9.50; Sn 0.50	Sheet, strip—Bearing alloy for bushings, bearings, clutch plates, thrust washers, jewelry, bezels, weatherstrips.
Leaded Bearing Bronze 116 Olin Mathieson Chemical Corp.	Cu 89.25; Zn 2.75; Sn 4.00; Pb 4.00	Sheet, strip—Bearings & bushings in automobiles, aircraft.

HIGH STRENGTH, LOW ALLOY STEELS

Name	Producer	Chemical Composition Limits, Per Cent C	Mn	P	S	Si	Cu	Mo	Cr
Cor-Ten	Acme Steel Co. Algoma Steel Co., Crucible Steel Co. of America, Greer Steel Co., Inland Steel Co., Lukens Steel Co., Republic Steel Corp.,	0.12 max	0.20–0.50	0.07–0.15	0.05 max	0.25–0.75	0.25–0.55	.....	0.30–1.25
Dynalloy	Alan Wood Steel Co.	0.15 max	0.60–1.00	0.05–0.10	0.05 max	0.30 max	0.30–0.60	0.05–0.15	.....
Hi-Steel	Inland Steel Co.	0.12 max	0.50–0.90	0.05–0.10	0.05 max	0.15 max	0.95–1.30	0.08–0.18	.....
Hi-Man	Inland Steel Co.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....
Jalten #1	Jones & Laughlin Steel Co.	0.15 max	1.30 max	0.04 max	0.05 max	0.10 max	0.30 min	.....	.....
Jalten #2	Jones & Laughlin Steel Co.	0.15 max	1.40 max	0.14 max	0.05 max	0.10 max	0.30 min	.....	.....
Jalten #3	Jones & Laughlin Steel Co.	0.25 max	1.60 max	0.04 max	0.05 max	0.30 max	0.20 min	.....	.....
Kaisaloy #1	Kaiser Steel Corp.	0.20 max	1.25 max	0.05 max	0.05 max	0.60 max	0.35 max	0.15 max	0.25 max
Man-Ten	U. S. Steel Corp.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....
Mayari-R	Bethlehem Steel Co.	0.12 max	0.50–1.00	0.12 max	0.05 max	0.10–0.50	0.20–0.50	.....	0.40–1.00
Medium Manganese	Bethlehem Steel Co.	0.25	1.10–1.60	0.04 max	0.05 max	0.30 max	0.20–0.35	.....	.....
N-A-X High Tensile	Great Lakes Steel Corp. Weirton Steel Co., Republic Steel Corp., Sharon Steel Corp., Granite City Steel Co. (2), Northeastern Steel Co.	0.15 max	0.50–1.00	0.04 max	0.05 max	0.60–0.90	0.25 max	0.20 max	0.40–0.70
N-A-X Finegrain (3)		0.18 max	0.60–1.00	0.04 max	0.05 max	0.60–0.90	0.25 max	.....	.....
Republic "50"	Republic Steel Corp.	0.12 max	0.50–1.00	0.04 max	0.05 max	0.15 max	0.30–1.00	0.10 min	0.30 max
Republic Type M	Republic Steel Corp.	0.25 max	1.60 max	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....
Tri-Ten	U. S. Steel Corp.	0.25 max	1.35 max	0.045 max	0.05 max	0.30 max	0.30–0.60	.....	.....
Tri-Ten E	U. S. Steel Corp.	0.22 max	1.25 max	0.040 max	0.05 max	0.30 max	0.20 min	.....	.....
Steicoloy #1	Steel Co. of Canada	0.15 max	0.60–0.90	0.08–0.12	0.04 max	0.25 max	0.40–0.60	.....	.....
Steicoloy #2	Steel Co. of Canada	0.14 max	1.10 max	0.04 max	0.04 max	0.25 max	0.30–0.40	.....	0.40–0.60
Yoloy	Youngstown Sheet & Tube Co.	0.15 max	0.75 max	0.10 max	0.05 max	0.30 max	0.75–1.25	.....	.....
Yoloy E	Youngstown Sheet & Tube Co.	0.18 max	0.90 max	0.10 max	0.05 max	.....	0.20–0.50	0.40 max	0.20–0.35
Yoloy M	Youngstown Sheet & Tube Co.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....

(1) Steels with copper over a minimum of 0.60 will respond to precipitation hardening, resulting in a higher strength level, depending on time-temperature cycle performed.
(2) Licensed; not presently producing.
(3) All licensees for N-A-X High Tensile are also licensed to produce N-A-X Finegrain.

PROPERTIES & TYPICAL APPLICATIONS: Strength of these steels as measured by their yield point is about 50 per cent higher than structural carbon steel. Working stress in tension can be as much as 50 per cent more. Besides higher fatigue resistance & can be fabricated by us material handling equipment, auto frames, earthmoving equipment, mine cars, agricultu towers, booms, cranes, dipper sticks, locom bridges, canal locks, gates & dams, lamp cabinets & re-usable shipping containers.

Name & Producer	Nominal Composition	Forms & Applications
Avialite—915 American Brass Co.	Cu 89.25; Sn 0.40; Al 9.25; Ni 0.50; Fe 0.60	Rod, bar—Pickling crates. Used where strength & resistance to corrosion at high temperatures is required as in parts for internal combustion engines.
Contact Bronze—92 (Tin Brass) Bridgeport Brass Co.	Cu 89.00; Sn 1.80; Zn 8.20	Strip—Electrical & radio spring applications.
Superloy (Tin Brass) Phelps Dodge Copper Products Corp.	Cu 88.00; Sn 2.00; Zn 10.00	Tube—Condensers & heat exchangers.
Ambronze—421 (Tin Brass) American Brass Co.	Cu 88.00; Zn 10.00; Sn 2.00	Tube—Condensers & heat exchangers.
Ampco Grade 15 (Aluminum Bronze) Ampco Metal Inc.	Cu 87.50; Al 9.25; Fe 3.20	Extruded solid & hollow rounds, shapes—Gears, small worm wheels, bushings, valve seats, guides.
Aluminum Bronze Olin Mathieson Chemical Corp.	Cu 87.00; Zn 7.00; Al 4.00; Fe 2.00	Sheet, strip—Bearings, bushings, thrust washers.
Ampco Grade 18 (Aluminum Bronze) Ampco Metal Inc.	Cu 85.50; Al 10.50; Fe 3.50	Extruded solid & hollow rounds, shapes—Bushings, bearings, worms & worm wheels, valve seats & guides, hydraulic valve parts, plungers, pump rods, guide-pin bushings, gibs, slides.
Manganese Red (Brass 507) American Brass Co.	Cu 85.00; Zn 14.00; Mn 1.00	Sheet, strip, plate—Electrical resistance welding.
Silicon Red (Brass 1027) American Brass Co.	Cu 82.00; Zn 17.00; Si 1.00	Sheet, strip, plate, wire, rod, bar—Electrical resistance welding.
Ambraloy—917 American Brass Co.	Cu 82.00; Al 9.50; Mn 1.00; Ni 5.00; Fe 2.50	Plate, rod, bar, die pressed forgings—Tube sheets for heat exchangers.
Manganese Red Brass Bridgeport Brass Co.	Cu 81.00; Mn 1.25; Zn 17.75	Strip—Spot & seam welding.
High-Silicon Brass Titan Metal Co.	Cu 81.00; Si 4.00; Zn 15.00	Rod, die castings, forgings—Valve parts, pole line hardware.
Manganese Cartridge Brass Bridgeport Brass Co.	Cu 70.00; Mn 1.25; Zn 28.75	Strip—Fabricates as well as 70-30 brass. Good for spot & seam welding.
Manganese Brass 277 Olin Mathieson Chemical Corp.	Cu 70.00; Zn 28.90; Mn 1.10	Sheet, strip—Same physical characteristics as cartridge brass except for lower electrical conductivity, permitting easier spot & seam welding.
Nittany—31 (Leaded Brass) Titan Metal Co.	Cu 62.00; Pb 1.70; Si 36.30	Rod—Screw machine products requiring assembly operations such as staking, turning over, etc.
Non-Leaded Bearing Alloy 601 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Zn 35.50	Rod—Screw machine products.
Medium-Leaded Bearing Alloy 602 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 1.00; Zn 34.50	Rod—Screw machine products, shaft bushings.
High-Leaded Bearing Alloy 604 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 2.50; Zn 33.00	Rod—Screw machine products.
Low-Leaded Bearing Alloy 605 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 0.50; Zn 35.00	Rod—Screw machine products, hydraulic pump connecting rod retainers.
Medium-Leaded Forgeable Bearing Alloy—603 Mueller Brass Co.	Cu 60.00; Mn 2.50; Si 1.00; Pb 1.00; Zn 35.50	Forgings—Hydraulic transmission gears, hydraulic pump cylinder barrels.
Free-Cutting Manganese Bronze (A), Leaded Titan Metal Co.	Cu 59.00; Pb 0.70; Sn 0.90; Fe 0.90; Mn 0.20; Zn 38.30	Rod, forgings—Valve parts, marine hardware.
Forgeable Bearing Alloy 600 Mueller Brass Co.	Cu 58.00; Mn 2.50; Si 0.75; Al 1.50; Zn 37.25	Forgings, rod—Screw machine products, chain saw clutch bearings, automotive transmission synchronizing rings, pyrometer bearings, squirrel cage feed fingers, hydraulic pump driving cams, lead screw nuts.
Tinicosil—54 (Extruded Leaded Nickel Silver) Titan Metal Co.	Cu 47.00; Ni 10.00; Pb 2.25; Mn 2.00; Zn 38.75	Round & hexagon rod—Screw machine products, instrument parts, fishing tackle, valve & plumbing parts.
Tinicosil—53 (Extruded Nickel Silver) Titan Metal Co.	Cu 46.00; Ni 10.00; Zn 44.00	Forgings—Plumbing, valves, instrument parts.

			PROPERTIES (up to and including ½-in. hot rolled) Yield Point Min psi	Tensile Strength Min psi	% Elongation in 2-in. for Stand. ASTM Spec.	
r	Ni	Others				
1.25	0.65 max	.....	50,000	70,000	22	
., Sharon Steel Corp.						
...	0.40–0.70	.....	50,000	70,000	25	
...	0.45–0.75	Al 0.12–0.27	50,000	70,000	22	(1)
...	.....	.....	50,000	75,000	20	
...	.....	V 0.035–0.065	50,000	65,000	22	
...	.....	.....	50,000	70,000	22	
...	.....	.....	50,000	70,000	22	
max	0.50 max	V 0.02 min Ti 0.005 min	50,000	70,000	22	
...	.....	.....	50,000	75,000	20	
1.00	0.50–1.00	.....	50,000	70,000	24	
...	.....	.....	50,000	75,000	20	
0.70	.....	Zr 0.05–0.15	50,000	70,000	22	
...	.....	Zr 0.05–0.15	50,000	70,000	22	
max	0.40–1.10	.....	50,000	70,000	23	
...	.....	.....	50,000	70,000	20	
...	0.40–0.90	.....	50,000	70,000	22	
...	.....	V 0.02 min	50,000	70,000	22	(1)
...	0.60–0.70	.....	50,000	70,000	22	(1)
0.60	0.40–0.60	.....	50,000	70,000	22	(1)
...	1.50–1.85	.....	50,000	70,000	22	
0.35	0.40–1.00	.....	50,000	70,000	22	
...	.....	.....	50,000	75,000	20	

gher yield strength, they have good corrosion, abrasion & y usual methods. Some applications: Tanks, trailers, trucks, es, wheels & bumpers, railroad cars, pole line hardware, ultural equipment, bridges, buckets, LPG cylinders, screens, comotive parts, mobile lifting equipment, portable military mp posts, auto jacks, cable reels, stokers, furnace bodies,

SUPERSTRENGTH STEELS

Material	Nominal Composition	Tensile Strength—Psi
SAE 4340 (AMS-6415)	C 0.40; Mn 0.65; Si 0.30; Cr 0.80; Ni 1.80; Mo 0.25	280,000 to 280,000
SAE 4360	C 0.60 version of 4340	280,000 to 300,000
Crucible HY-Tuf (AMS-6418)	C 0.25; Mn 1.30; Si 1.50; Ni 1.80; Mo 0.40	230,000
Crucible UHS-280	C 0.35; Mn 1.25; Si 1.85; Cr 1.25; V 0.20; Mo 0.35	280,000 min
Crucible UHS-280 or UHS-300	Formerly High Carbon Super HY-Tuf. Available in experimental quantities only	280,000 or 300,000 range
U. S. Steel USS Strux (Mod. 98BV40)	C 0.35 to 0.40; Mn 0.85; Si 0.70; Ni 0.80; Cr 0.75; Mo 0.50; V 0.06; B 0.0015	280,000 to 280,000
U. S. Steel USS Strux (Mod. 98BV40)	C 0.40 to 0.45 version of above	280,000 to 300,000
SAE 4330 modified with Vanadium (AMS 6427)	C 0.30; Mn 0.90; Si 0.30; Ni 1.80; Cr 0.85; Mo 0.45; V 0.05 to 0.10	220,000 to 240,000
Timken H. S. 220 (AMS 6407)	C 0.30; Mn 0.70; Si 0.60; Ni 2.05; Cr 1.20; Mo 0.45	220,000 to 240,000
Timken H.S. 280	C 0.40; Mn 0.70; Si 0.60; Cr 1.20; Ni 2.05; Mo 0.45	280,000 to 280,000
International Nickel Co. Tricent	C 0.40; Mn 0.70; Si 1.60; Ni 1.90; Cr 0.90; Mo 0.45; V 0.07; Al 0.02	280,000 to 300,000
Super Tricent (experimental)	C 0.55; Mn 0.80; Si 2.10; Ni 3.60; Cr 0.90; Mo 0.50	340,000

APPLICATIONS: In their appropriate tensile strength ranges, these steels are designed to provide the maximum usable strength where minimum weight is of primary importance. Uses are in aircraft landing gear & airframe components, wing pylon parts & fasteners, wing attachment fittings & superstrength bolts. Other applications: Sheet or plate parts for supersonic speeds, pressure vessels for aircraft use, oil well perforating guns & carbide bit bodies. Examples of other constructional parts are axles, gears & shafting of all types. Although the acceptance of many of these superstrength steels will be a gradual process, today's trend toward machines & equipment operating at higher and higher stress levels will increase their ultimate use in many applications.

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Hot Rolled Strip
Cold Rolled Sheets
Cold Rolled Strip

ROLLED STEEL FLOOR PLATE
A. W. Algrip abrasive
A. W. Super-Diamond pattern

A. W. CUT NAILS
Standard & Hardened

MINE PRODUCTS
Iron Ore Concentrates
Iron Powder
Crushed Stone
Grit
Sand & Engine Sand

COKE
Foundry, Industrial & Metallurgical

COAL CHEMICALS
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Benzol
Toluol
Xylol
Naphthalene
Sodium Phenolate
Tar Bases (Pyridene)
Solvent Naphtha
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For detailed information on any Alan Wood Product, write Marketing Division—Department AW-51.

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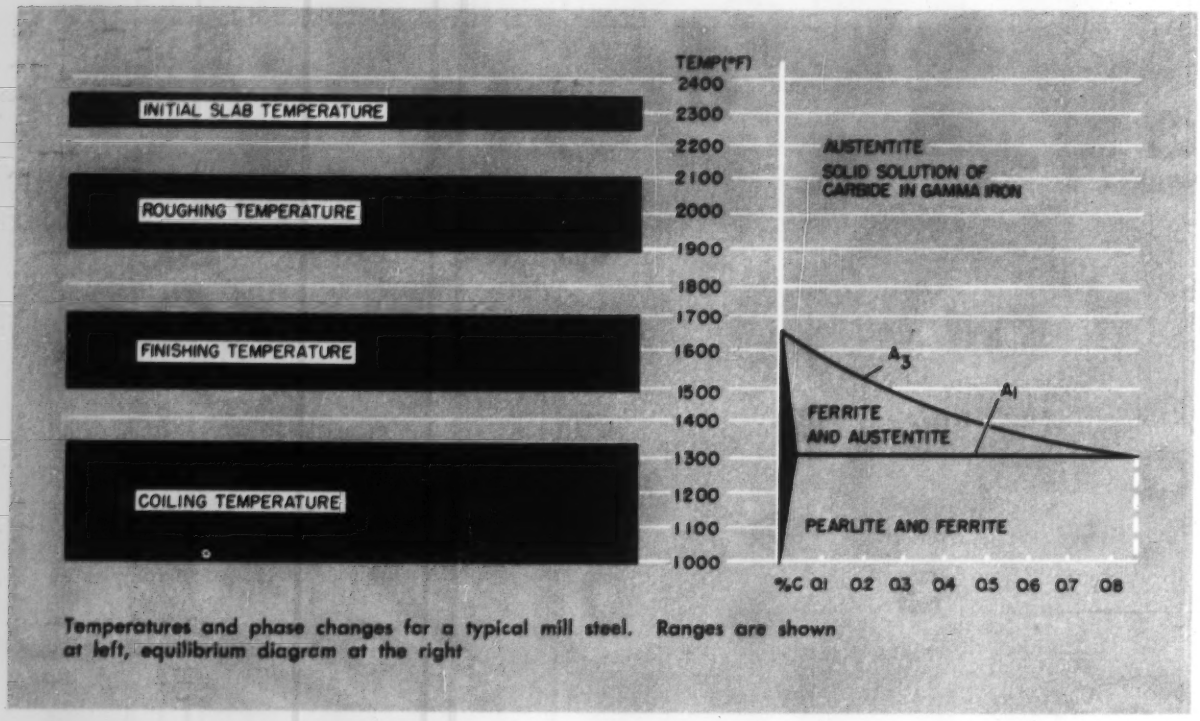

Temperatures and phase changes for a typical mill steel. Ranges are shown at left, equilibrium diagram at the right

How Temperature Affects Strip

The customer's product determines the qualities needed in good strip. By varying his practices, the mill metallurgist can control physical properties

By E. L. ROBINSON and D. T. GOETTGE
U.S. Steel Corp.
Pittsburgh

HERE is one of the most important rules for making good steel strip: Control finishing and coiling temperatures to regulate physical properties.

More than any other rolling mill factor, those temperatures affect the phase changes of ferrite, austenite and pearlite. They determine hardness, final grain size and carbide distribution.

Guide—When a customer orders steel from a mill, he usually indicates the end use and the kind of operations it will undergo. With such guides, the mill metallurgist selects a suitable steel, specifies slab dimensions and strip operations.

Good strip from the hot mill has these characteristics:

1. A 0.001 to 0.003 in. crown without dips, flats or wedge shapes. Deviations cause metal build-ups in cold reduction. Excessive dropoff (thin) edges are bad for the lighter gages.

2. Uniform gage, width and camber. If the thickness of a coil changes from one end to the other, it adds to the problems of cold reduction. Excessive variation in width causes guide trouble and piles up scrap later on. Too much camber is a mischief maker.

3. The right oxide coating (if strip is pickled in acid). To get it, mills use the maximum amount of table cooling water and cold coiling temperatures. A compromise is usual if they conflict with the temperatures needed for good metallurgical properties.

4. Good surface and edge characteristics. Strip should be free from rolled-in scale, scale flashing, heat pattern and pits. Cracks or slivered edges are taboo—they cause breakage in cold reduction; pieces of the edge metal show up as surface defects.

Grain—Let's see how finishing and coiling temperatures affect a conventional rimmed steel (0.10 carbon, 0.30 to 0.40 manganese).

Finishing at 1600 to 1615°F leaves a relatively uniform grain structure, about ASTM size 8. The

This unretouched photograph shows deterioration of 25-12 alloy radiant tube after 10 months service.

This unretouched photograph shows radiant tube of NA22H still in serviceable condition after 78 months service in the hot zone where temperatures averaged 1850°F.

NA22H establishes new service record!

Has provided five times longer service life for radiant tubes in annealing furnace...and still going strong

Faced with mounting production losses and increasing tube replacement costs, a manufacturer of continuous weld carbon pipe began to experiment with the new high temperature alloy NA22H for the "W" type radiant tubes in his annealing furnaces.

After seven years of in-use testing in all heat zones of the furnaces, this user found that the service life of radiant tubes made of NA22H was increased far beyond the performance range of radiant tubes made of 25-12 type alloy.

After a total of 78 months service in temperatures ranging from 1700 to 1925°F., the NA22H tubes were found to be in good condition and still continue in service. A 25-12 tube installed in the same position failed after 10 months service.

Since its introduction eight years ago, NA22H has proven itself in many applications where severe operating conditions and elevated temperature ranges are the rule.

A National Alloy engineer will be glad to show you further proof of performance, and to discuss the use of NA22H in your operation.

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surface is slightly coarser, probably the effect of the lower metalloid rim of the steel rather than the rolling temperature. If end use calls for a grain structure like that, you can probably eliminate normalizing.

A lower finishing temperature (say 1525 to 1560°F, below the austenite to ferrite transformation) hot works a considerable amount of ferrite. The result: A fine grained core with a coarse-grained surface.

Strip finished at low temperatures contains a certain amount of residual strain. When followed by a high coiling temperature (1300° F plus), gross recrystallization takes place, increasing grain coarseness.

Carbides—High coiling temperatures (1335°F) produce coarse carbides and pearlite for several reasons.

First, some austenite is transformed to pearlite within the coil during the relatively slow cooling period.

Second, previously precipitated carbides agglomerate into larger carbides or pearlite during the cooling period.

Third, because carbon solubility in ferrite decreases quickly as the coil cools from 1335°F, carbides precipitate at the highest temperatures, getting maximum opportunity for growth.

A lower coiling temperature (1115°F) encourages the formation of fine pearlite and limits agglomeration of carbides.

The effects of coiling temperatures are superimposed on the finishing characteristics.

Hot Practice—The metallurgist varies his rolling program with various combinations of heat, temperature, compositions, etc. If the end product needs drawability (like steel for automotive crossmembers), he uses a high finishing temperature and manipulates the coiling temperature. If he wants a low hardness value, he specifies low coiling with high finishing temperatures. Or he may permit a low finishing temperature to combat scale—a compromise with good uniformity.

Cold Reduction—Hot rolled coils are pickled, cold reduced, annealed and temper rolled to make standard, cold-rolled sheet.

The grain size of cold-rolled sheet responds more to changes in coiling than finishing temperatures. The relationship is similar to that of the carbides in hot-rolled sheet. Grain size deviation from the average is minimized by a high finishing temperature.

The reasons for that aren't quite clear, but it is probable that carbide size (which depends primarily on coiling temperature) influences the recrystallization of ferrite during any annealing that follows cold reduction.

Deep Draws — The best black plate for heavy draw work is made with high finishing and coiling temperatures in the hot mill. The subcritical annealing following cold reduction affects coarseness only slightly. There is some growth and rounding of the carbides.

Carbide distribution (as opposed to size) in cold-rolled sheet reflects the finishing temperatures in the hot mill. The carbide stringers, associated with low finishing temperatures, persist even after annealing.

How carbides are distributed are important to the drawing characteristics. Distribution also affects the hydrogen embrittlement of cold products when they are acid pickled, and distribution is used to improve specific properties in tin plate.

Heat Measurement—The measurement of surface temperatures by radiation or optical means is at best tricky. Water, steam, oxides and dust add to the problem.

The situation can be improved by careful use of air, steam or water sprays to clear the strip areas near temperature instruments.

How Hot Mill Temperatures Affect Sheet

Hardness (Rockwell B) Hot Rolled Sheets

	Hot Coiling (Above 1300°F)		Cold Coiling (Below 1300°F)	
	Average	Range	Average	Range
Finish Hot (1600°F)	55	53-58	58	55-59
Finish Cold (Below 1550°F)	42	37-56	54	45-66

This is how hot and cold finishing and coiling temperatures affect the hardness of strip. All figures are in Rockwell B scale

Hardness (Rockwell B) Cold Rolled and Annealed

	Hot Coiling (Above 1300°F)		Cold Coiling (Below 1300°F)	
	Average	Range	Average	Range
Finish Hot (1600°F)	43.5	41-46	46.5	42-48
Finish Cold (Below 1550°F)	42.7	38-50	45.3	38-51

Cold reduced and annealed sheet is affected by temperatures in hot mill production. Here are the results. Figures are Rockwell B scale

Grain Size (ASTM) Cold Rolled and Reduced

	Hot Coiling (Above 1300°F)		Cold Coiling (Below 1300°F)	
	Average	Range	Average	Range
Finish Hot (1600°F)	6.8	6.5-7.5	7.6	7.0-8.5
Finish Cold (Below 1550°F)	6.9	6.5-9.0	7.5	6.5-8.5

The grain size in cold rolled sheet reflects hot mill practice. The figures are standard ASTM grain size numbers

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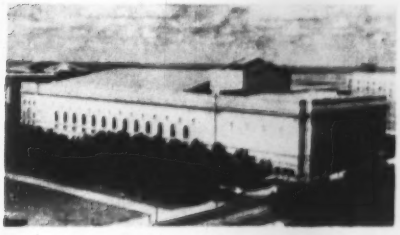

AMERICAN SOCIETY FOR METALS

Preshow Seminar—Creep and Recovery

Saturday, Oct. 6, 9 a.m.—12 noon

Grand Ballroom, Hotel Statler

Chairman: Dr. R. L. Cunningham, Bureau of Mines, Ottawa, Canada

Defects and Recovery—Prof. J. Koehler, University of Illinois.

The Thermodynamics and Kinetics of Recovery—Prof. M. B. Bever, Massachusetts Institute of Technology.

Polygonization—Dr. W. R. Hibbard Jr., General Electric Research Laboratories.

D. S. Clark, President

G. M. Young, Vice President

Saturday, Oct. 6, 2—5 p.m.

Chairman: Prof. B. L. Averbach, Massachusetts Institute of Technology.

Recovery of Electrical Resistivity—Dr. T. H. Blewitt, Oak Ridge National Laboratories.

Recovery of Mechanical Properties—Dr. E. C. W. Perryman, Atomic Energy Establishment, Chalk River, Canada.

Recovery of Internal Friction and Elastic Constants—Prof. A. S. Nowick, Yale University.

Saturday, Oct. 6—8 p.m.

Chairman: Prof. Bruce Chalmers, Harvard University.

The Concept of Creep—Dr. E. N. da C. Andrade, F. R. S., London, England.

Sunday, Oct. 7, 9 a.m.—12 Noon

Chairman: Prof. P. A. Beck, University of Illinois.

Theory of Creep—Dr. G. Schoeck, Westinghouse Research Laboratories.

The Role of the Boundary in Creep Phenomena—Prof. E. R. Parker and J. Washburn, University of California.

The Effect of Alloying Elements on Creep—Dr. J. C. Fisher, General Electric Research Laboratories.

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ORE — The short haul from the big modern Port of Norfolk to your production site will save you time and money in the overland transportation of iron ore and other needed mineral imports.

LIMESTONE — At easily accessible points along the N&W there are newly discovered deposits of limestone of almost unbelievable purity. These deposits contain more than 100 million tons in minable beds of over 100 feet in thickness.

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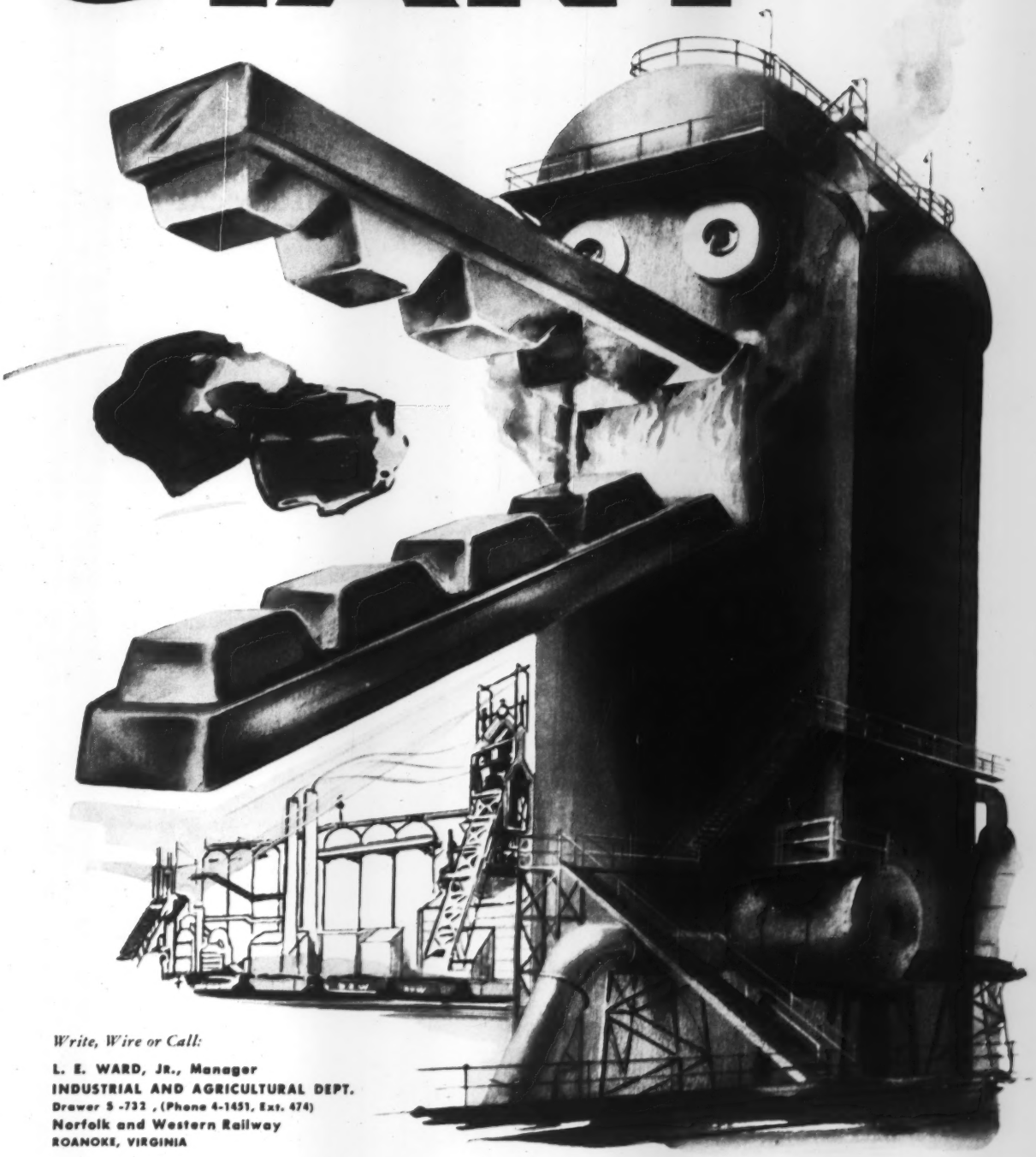

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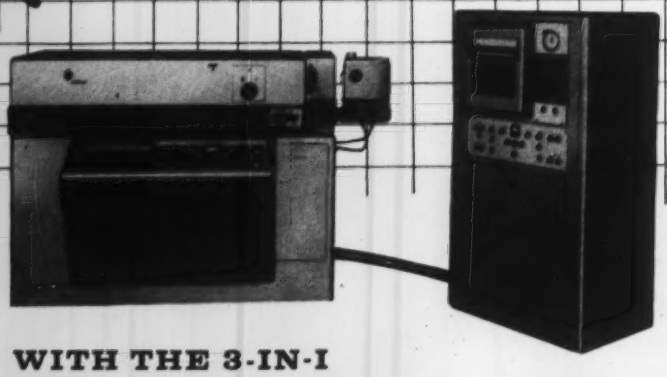

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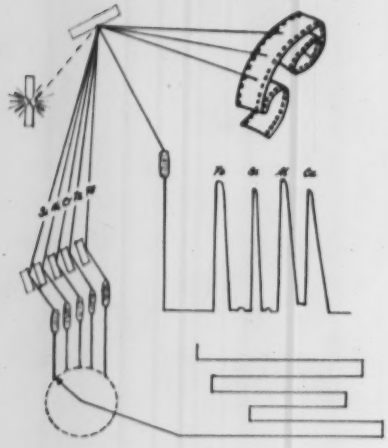

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ASM PROGRAM

Sunday, Oct. 7, 2—5 p.m.

Chairman: Dr. Eric Jette, Los Alamos, New Mexico.

The Spectrum of Activation Energies for Creep—Prof. J. E. Dorn, University of California.

Creep and Fracture—Prof. N. J. Grant, Massachusetts Institute of Technology.

Creep of Crystalline Nonmetals—J. B. Wachtman Jr., National Bureau of Standards.

TECHNICAL PAPERS

Monday, Oct. 8—9:30 a.m.

All Sessions at Statler Hotel

PLASTIC DEFORMATION

Presiding officers: L. J. Ebert, Case Institute of Technology. H. Y. Hunsicker, Aluminum Co. of America.

Slip, Twinning and Fracture in Single Crystals of Iron—J. J. Cox, E. I. du Pont de Nemours & Co.; G. T. Horne, and R. F. Mehl, Carnegie Institute of Technology.

Dynamic Biaxial Stress-Strain Characteristics of Aluminum and Mild Steel—George Gerard, Ralph Papirno, New York University.

Some Exploratory Observations of the Tensile Properties of Metals at Very Low Temperatures—E. T. Wessel, Westinghouse Research Laboratories.

Effect of Strain Rate and Temperature on the Plastic Deformation of High Purity Aluminum—T. A. Trozera, O. D. Sherby and J. E. Dorn, University of California.

Monday, Oct. 8—9:30 a.m.

IRON

Presiding Officers: Paul G. Nelson, Budd Co., Charles C. Reynolds, Massachusetts Institute of Technology.

The Effect of Subboundaries and Carbide Distribution on the Notch Toughness of an Ingot Iron—J. C. Danko and R. D. Stout, Lehigh University.

Notch Ductility of Malleable Irons—G. A. Sandoz, N. C. Howells, H. F. Bishop and W. S. Pellini, Naval Research Laboratory.

New Nodular Iron Process—Harry K. Ihrig, Allis-Chalmers Mfg. Co.

The Deformation and Rupture of Gray Cast Iron—W. R. Clough, Electro Metallurgical Co., and M. E. Shank, Massachusetts Institute of Technology.

Monday, Oct. 8—2 p.m.

TITANIUM

Presiding officers: William Southard, Kennecott Copper Co. James L. Wyatt, Horizons Inc.

Relative High Temperature Properties of the Hexagonal-Close-Packed and Body Centered-Cubic Structures in Iodide-Titanium — John Lunsford and N. J. Grant, Massachusetts Institute of Technology.

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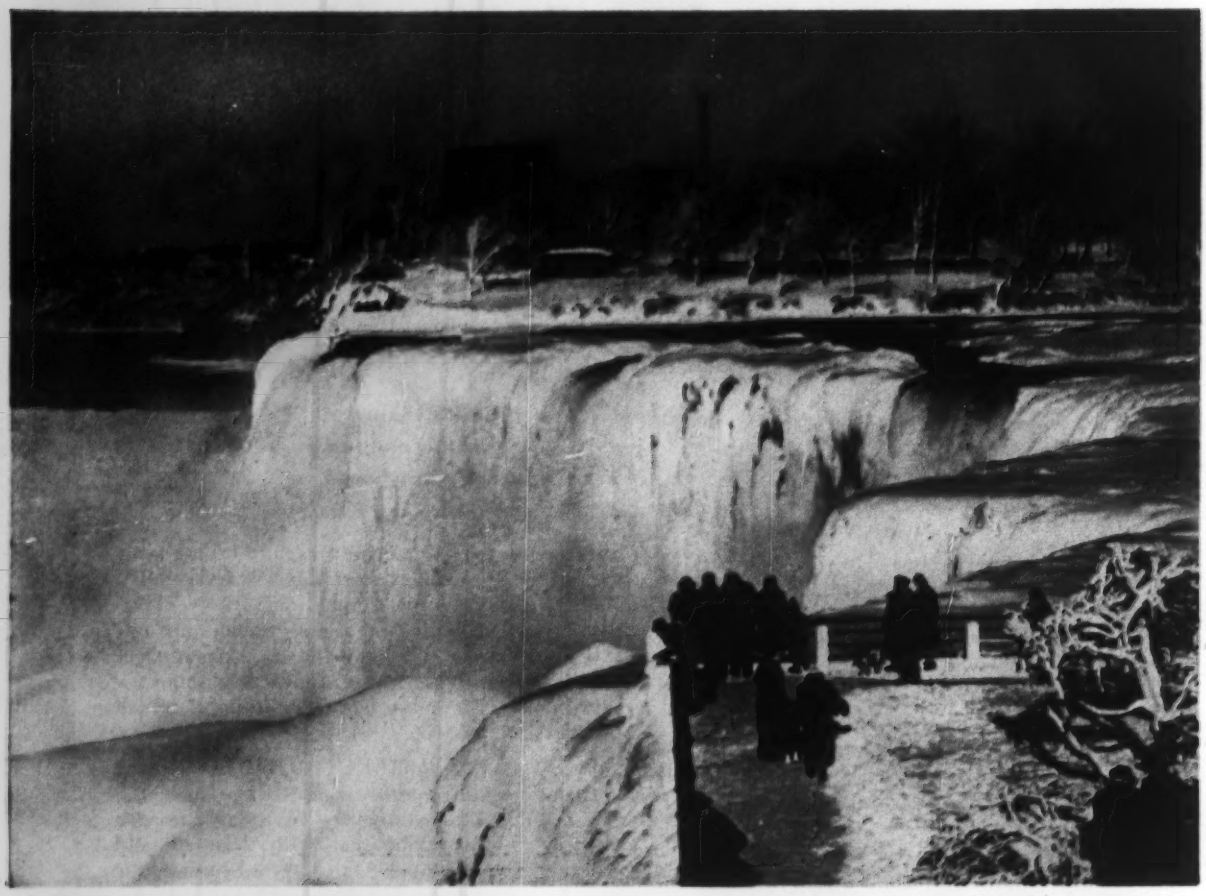

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ASM PROGRAM

The Influence of Alloying on the Elastic Modulus of Titanium Alloys—W. H. Graft, D. W. Levinson and W. Rostoker, Armour Research Foundation.

A Study of the Air Contamination of Three Titanium Alloys—J. E. Reynolds, H. R. Ogden and R. I. Jaffee, Battelle Memorial Institute.

Effect of Sulphur on the Properties of Titanium and Titanium Alloys—L. W. Berger, D. N. Williams and R. L. Jaffee, Battelle Memorial Institute.

Relationship Between Heat Treatment, Structure and Mechanical Properties of a Titanium Alloy Containing 4% Cr and 2% Mo—A. W. Goldenstein and W. Rostoker, Armour Research Foundation.

Tuesday, Oct. 9—9 a.m.

STEEL

Presiding officers: Fran Bolger, Battelle Memorial Institute. George H. Enzian, Jones & Laughlin Steel Co.

Temperability of Steels—L. D. Jaffe, California Institute of Technology, and Edward Gordon, United Gas Corp.

The Temperature Dependence of the Hardness of "Pure" Iron and Various Ferritic Steels—F. Garofalo and D. C. Marsden, U. S. Steel Corp., Edgar C. Bain Research lab., Monroeville, Pa. and G. V. Smith, Cornell University.

The Influence of Bainite on Mechanical Properties—R. F. Hehemann, V. Luhanov and A. R. Troiano, Case Institute of Technology.

On the Cooling Transformations in Some 0.40% Carbon Constructional Alloy Steels—D. J. Blickwede and R. C. Hess, Bethlehem Steel Co.

Tuesday, Oct. 9—2 p.m.

STEEL

Presiding officers: R. D. Chapman, Chrysler Corp. C. T. Evans, Universal-Cyclops Steel Corp.

Impact Characteristics and Mechanical Properties of Leaded and Nonleaded C-1050 and C-1141 Steels—A. P. Weaver, Inland Steel Co.

Relation of Inclusions to the Fatigue Properties of SAE 4340 Steel—H. N. Cummings, F. B. Stulen and W. C. Schulte. Curtiss-Wright Corp.

Effect of Silicon on Transverse Properties and on Retained Austenite Content of High Strength Steels—John Vajda, J. J. Hauser and Cyril Wells, Carnegie Institute of Technology.

Bend: Tensile Relationships for Tool Steels at High Strength Levels—J. C. Hamaker Jr., V. G. Strang, and G. A. Roberts, Vanadium-Alloys Steel Co.

Wednesday, Oct. 10—2 p.m.

STAINLESS

Presiding officers: A. E. Nehrenberg, Crucible Steel Co. of America. Ed. E. Reynolds, Allegheny Ludlum Steel Corp.

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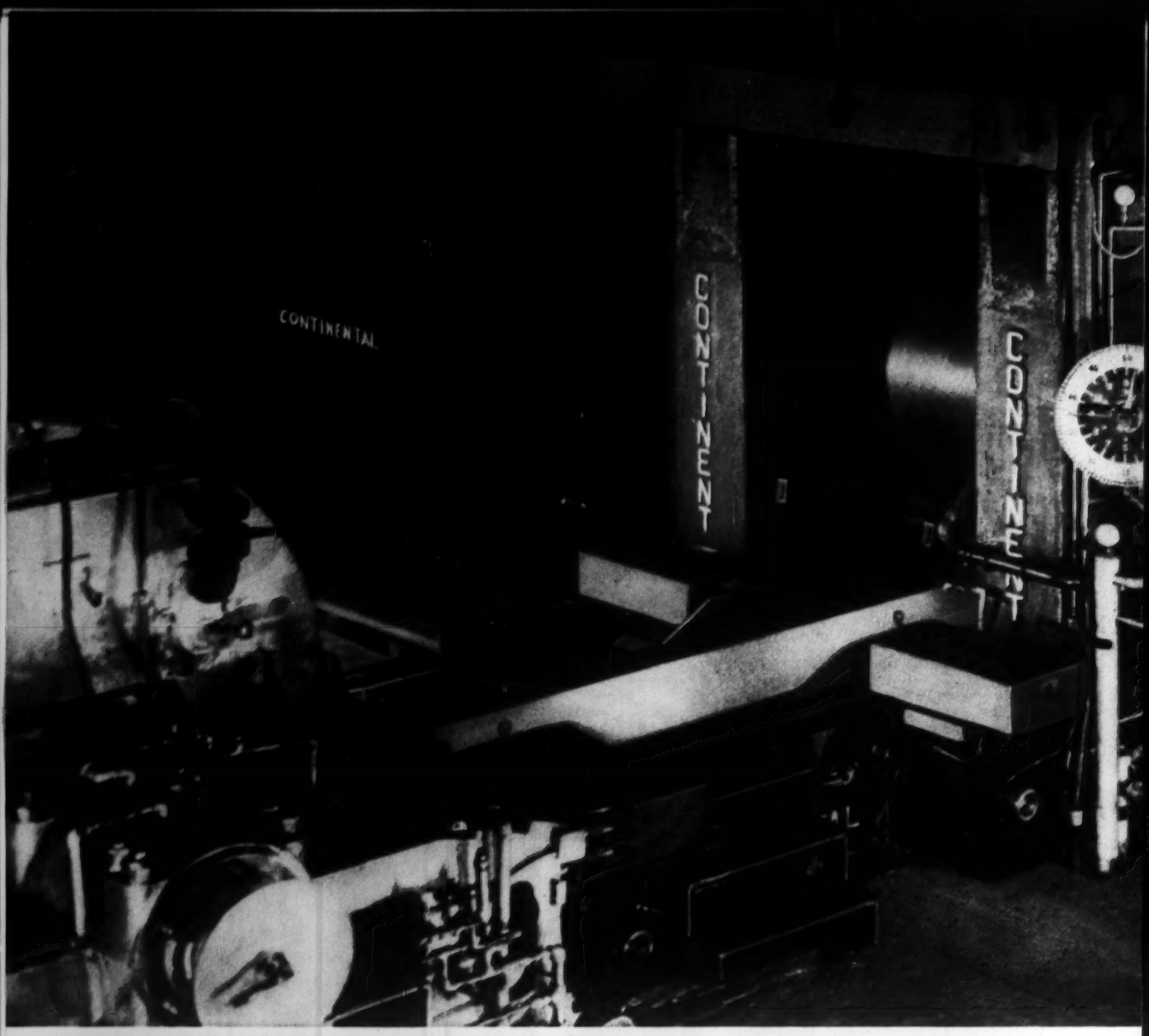
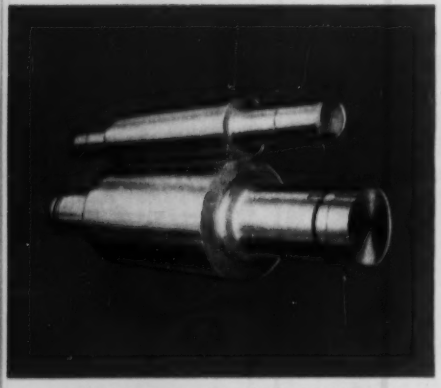
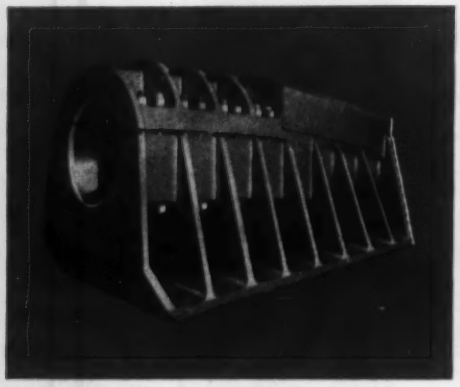


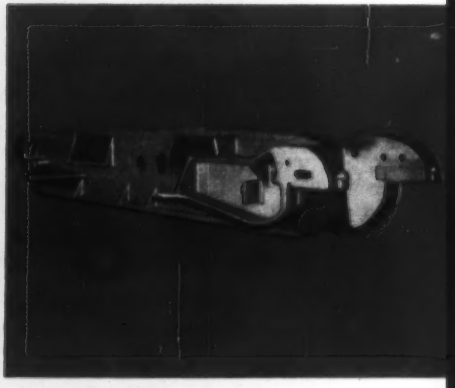
CONTINENTAL 26" x 49" x 66", 4-high reversing hot strip mill in the Newport Steel Corporation Plant, Newport, Kentucky.



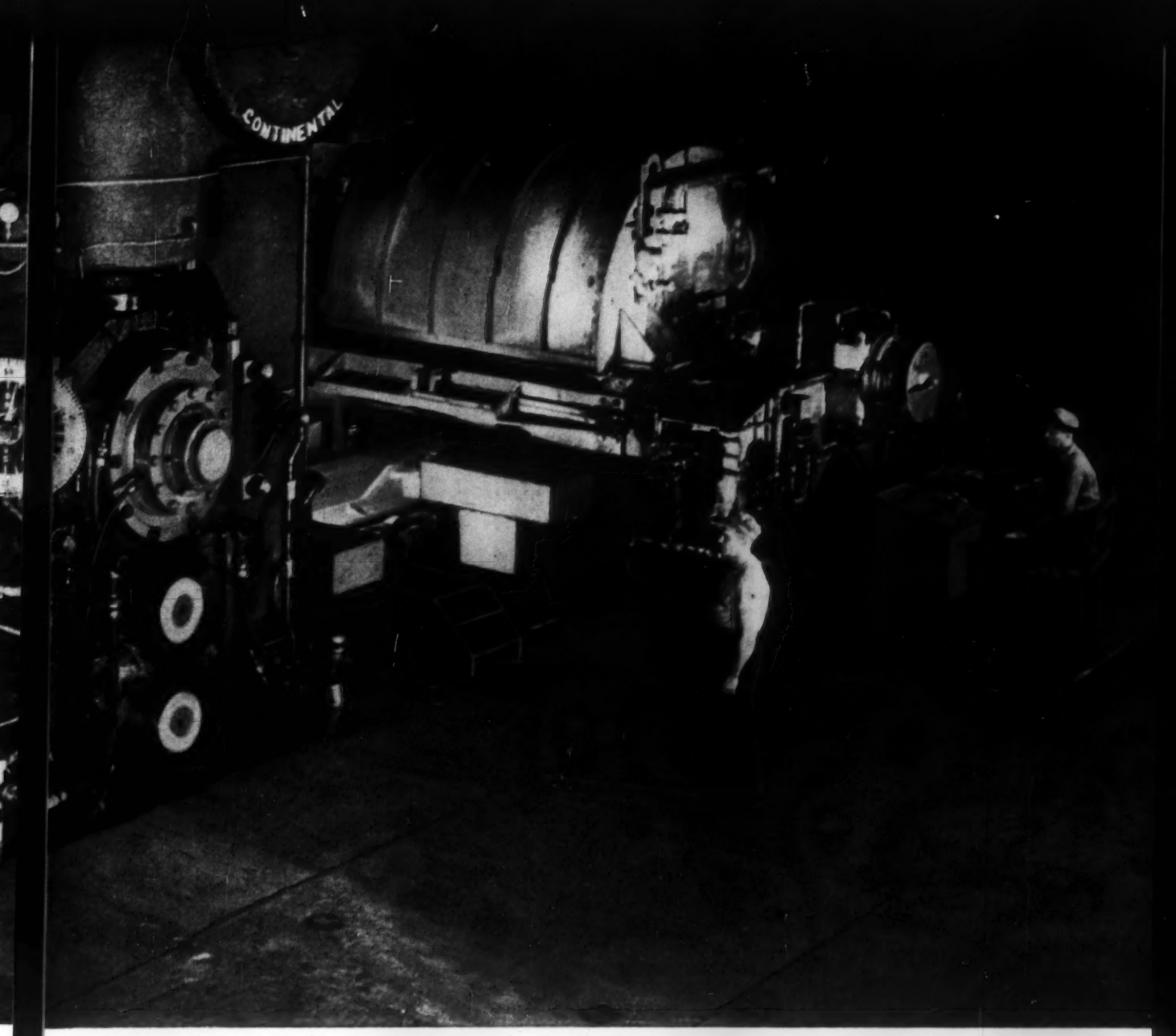
ROLLS—iron, alloy iron and steel rolls for all types of rolling mills.



CASTINGS—carbon and alloy steel castings from 20 to 250,000 pounds.



WELDMENTS—fabricated steel plate, or cast-weld design.



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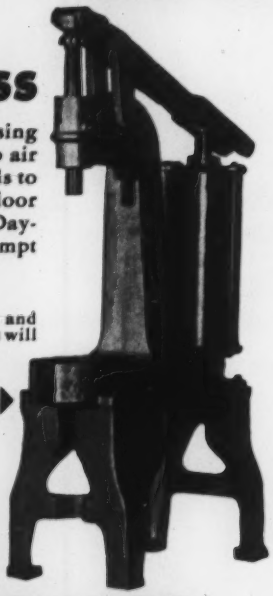

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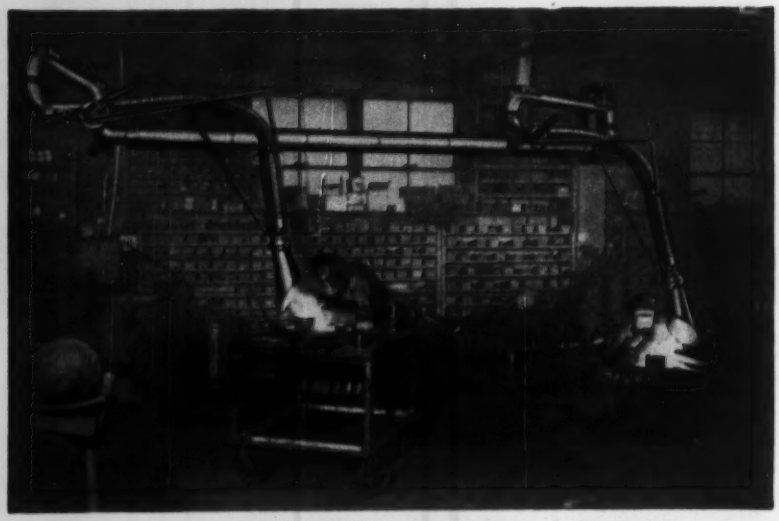

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ASM PROGRAM

Precipitation Reactions in Austenitic Cr-Mn-C-N Stainless Steels—Chi-Mei Hsiao and F. J. Dulis, Crucible Steel Co. of America.

Martensitic Transformation in the Machining of Austenitic Stainless Steel—E. F. Erbin, Titanium Metals Corp. of America; E. R. Marshall, University of Vermont; and W. A. Backofen, Massachusetts Institute of Technology.

Transformation Products in Cold-Worked Austenitic Manganese Steel—R. K. Buhr, S. L. Gertsman, Department of Mines and Technical Surveys, Ottawa, Ont., and James Reekie, Northern Electric Co. Ltd., Montreal, Que.

Metallography of Titanium-Stabilized 18-8 Stainless Steel—T. V. Simpkinson, Republic Steel Corp.

Phase Relationships and Mechanical Properties of Some Iron-Chromium-Carbon-Nitrogen Alloys — G. F. Tisinai and C. H. Samans, Standard Oil Co. (Indiana).

Wednesday, Oct. 10—2 p.m.

NUCLEAR MATERIALS

Presiding officers: W. D. Manly, Oak Ridge National Laboratory. Frank Rough, Battelle Memorial Institute.

Creep and Stress Rupture Properties of Zirconium Effect of Annealing Treatment—R. W. Guard and J. H. Keeler, General Electric Co.

Transformation Kinetics of Uranium-Niobium and Ternary Uranium-Molybdenum-Base Alloys—R. J. Van Thyne and D. J. McPherson, Armour Research Foundation.

Transformation Kinetics of Uranium-Molybdenum Alloys—R. J. Van Thyne and D. J. McPherson, Armour Research Foundation.

The Plastic Deformation of Uranium on Thermal Cycling—H. H. Chiswik, Argonne National Laboratory.

Thursday, Oct. 11—9:30 a.m.

HIGH TEMPERATURE

Presiding officers: Glenn A. Fritzlen, Haynes Stellite Co. L. P. Jahnke, General Electric Co.

Effect of Sigma Phase on Co-Cr-Mo Base Alloys—Ronald Silverman, Sylvania Electric Co., William Arbiter, Nuclear Development Corp. of America; and Frank Hodi, U. S. Army.

An Austenitic Alloy for High Temperature Use—R. W. Guard and T. A. Prater, General Electric Research Laboratory.

High Temperature Rupture-Strength Properties of Chromium-Nickel Stainless Steels Containing Titanium and Boron—J. Salvaggi and L. A. Yerkovich, Cornell Aeronautical Laboratory Inc.

Effect of Environment on Creep-Rupture Properties of Some Commercial Alloys—Paul Shahinian, Naval Research Laboratory.

The Influence of Molybdenum on the Phase Relationships of a High Temperature Alloy—H. J. Beattie Jr. and F. L. Ver-Snyder, General Electric Co.

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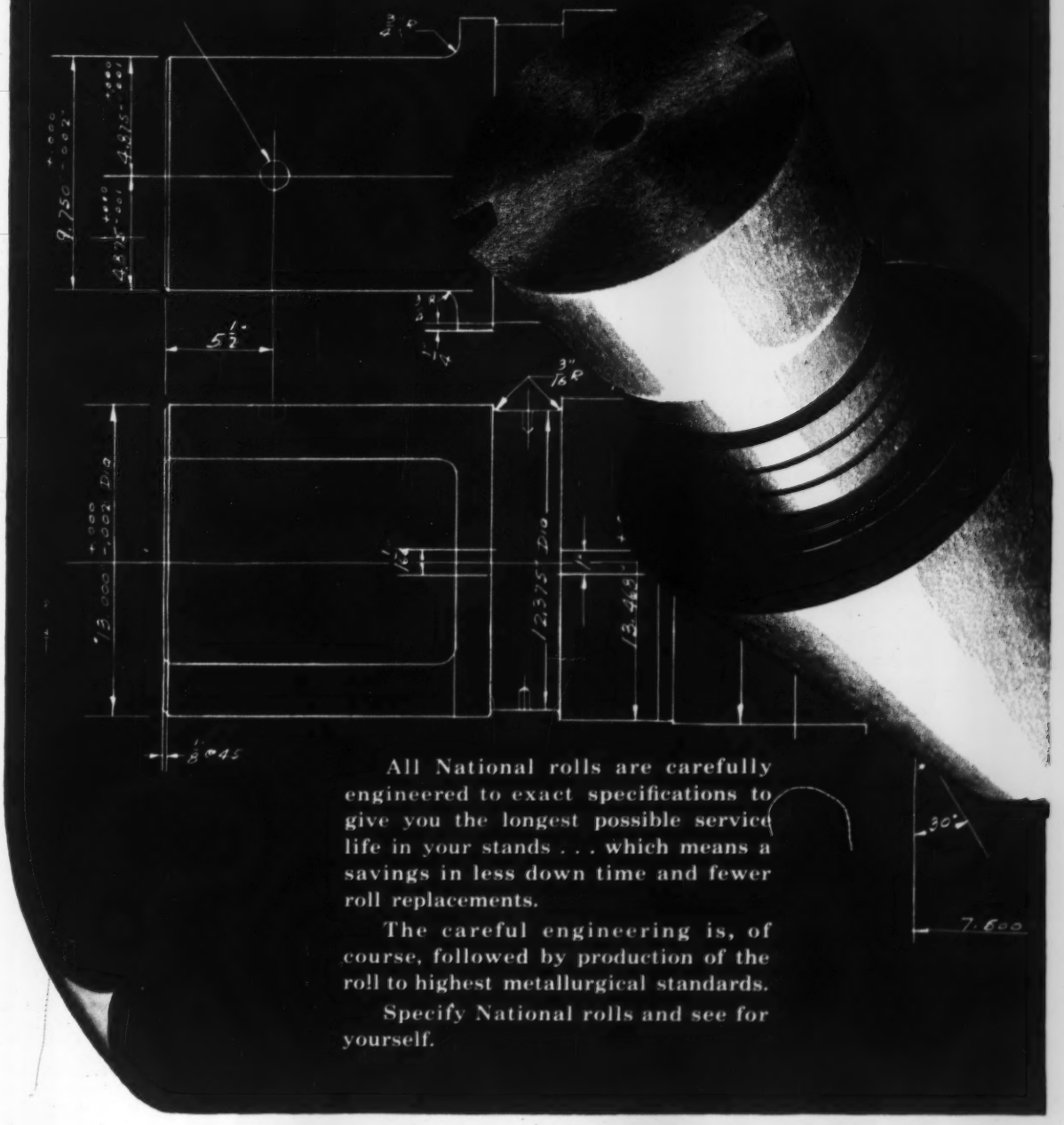

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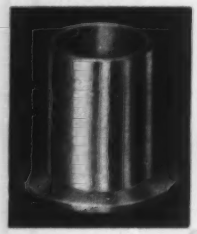

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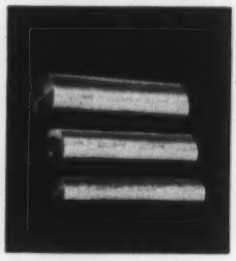

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ASM PROGRAM

Thursday, Oct. 11—2 p.m.

HIGH TEMPERATURE

Presiding officers: J. Freeman, University of Michigan. E. J. Whittenberger, U. S. Steel Corp.

The Mechanical Properties of Iron-Aluminum Alloys—W. Justusson, V. F. Zackay and E. R. Morgan, Ford Motor Co.

Some High Temperature Oxidation Characteristics of Nickel with Chromium Additions—G. E. Zima, International Nickel Co.

The Mechanical Properties of Swaged Iodide-Base Chromium and Chromium Alloys—D. J. Maykuth and R. I. Jaffee, Battelle Memorial Institute.

Effect of Dispersion of Alpha Phase on the High Temperature Fatigue Properties of Alpha-Beta Brass—J. E. Breen, Naval Research Laboratory, and J. R. Lane, National Research Council.

Aging Reactions in Certain Super-Alloys — W. C. Hagel and H. J. Beattie Jr., General Electric Co.

All Sessions in Hotel Carter

THE SCOPE OF THORIUM

Thursday, Oct. 11—9:30 a.m.

Chairmen: Dr. F. H. Spedding and Edward Epremian, U. S. Atomic Energy Commission.

The Role of Thorium Metal in the Nuclear Field—John P. Howe, Atomics International.

Nonnuclear Applications of Thorium Metal Other Than in Magnesium Technology—Dr. William C. Lilliendahl, Westinghouse Electric Corp.

The Uses of Thorium in Magnesium Technology—T. E. Leontis, Dow Chemical Co.

The Production of Thorium Compounds—Morton Smutz and John Barghusen, U. S. Atomic Energy Commission.

Development of Thorium Tetrafluoride-Calcium Process for Thorium Metal—Harley A. Wilhelm, U. S. Atomic Energy Commission.

Consumable-Electrode Arc Melting of Thorium—A. H. Roberson, U. S. Bureau of Mines.

Powder Metallurgy of Thorium (Including Reduction of Thorium Oxide by Calcium)—B. Kopelman, Sylvania Electric Co.

Spectrographic Analysis of Thorium Metal—V. A. Fassel and Edward DeKalb, U. S. Atomic Energy Commission.

Chemical Analysis of Thorium Metal—C. J. Rodden and Morris W. Lerner, U. S. Atomic Energy Commission.

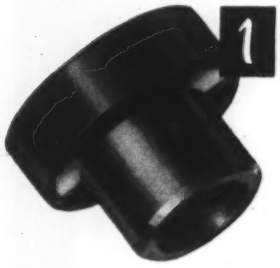
Purification of Thorium Metal by the Iodide or Hot-Wire Process—Ivor E. Campbell, Battelle Memorial Institute.

The Electrolytic Refining of Thorium—R. A. Noland, Argonne National Laboratory.

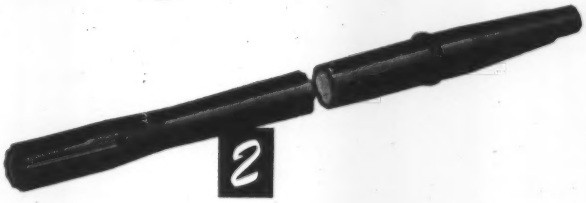
Thursday, Oct. 11—2 p.m.

Chairmen: R. Carson Dalzell, U. S. Atomic Energy Commission. Dr. H. A. Wilhelm, U. S. Atomic Energy Commission.

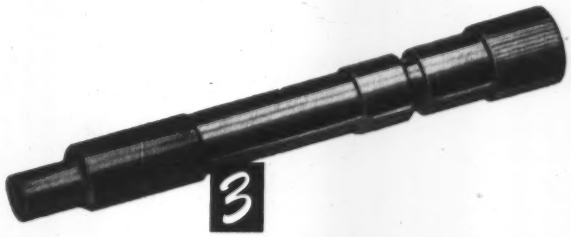
7 WAYS to SAVE MONEY with TOCCO* Induction Hardening



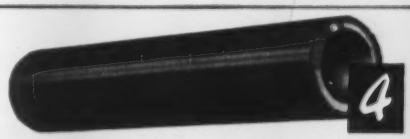
Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½c saved on every piece — $4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.



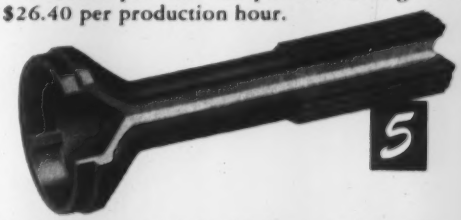
Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of $375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.



Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from $1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.



Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from $5.45 to $3.25 per hundred parts—a savings of 2c per pin, $26.40 per production hour.



Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.

7 Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

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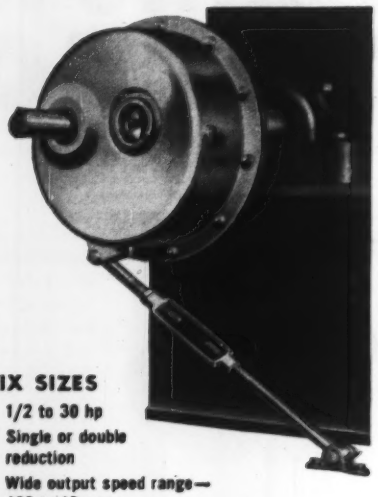
EFFICIENT SPEED REDUCTION IN LIMITED SPACE



SIX SIZES

- 1/2 to 30 hp
- Single or double reduction
- Wide output speed range—420 to 10 rpm

Expressly designed for topflight performance on installations requiring considerable speed reduction in limited space, the all-steel FALK Shaft Mounted Drive has quickly won acceptance throughout industry. This sturdy, compact, versatile reducing unit is an ingenious variation of the highly successful FALK Motoreducer design, pacemaker in its field for more than 20 years. Here, the time-proved design is adapted for mounting directly on the shaft to be driven, using V-belt connection to motor. Investigate now!

Here is the "INSIDE INFORMATION" on FALK ALL-STEEL Shaft Mounted Drives

Take a careful look inside the Falk all-steel Shaft Mounted Drive, and you will know why this newest member of the famous Falk family is ideal for applications where direct mounting on the driven shaft is desirable. It is the only drive in its field with all these superior "In-built" factors:—

1 **All-steel Frame,** with more than double the rigidity of iron, supports all rotating elements.

2 **Precision Helical Gears,** designed and machined by Falk, rated to AGMA standards.

3 **Pressed Steel Housings,** whose sole function is to keep oil in, dirt out; easily removed for gear inspection without dismounting unit.

4 **Through Hollow Shaft** with counter bore provides for easiest installation or removal from driven machine shaft extensions.

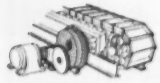
5 **Backstop** can be furnished with the unit or added later for positive prevention of reverse rotation.

6 **Positive Lubrication,** continuous direct dip of revolving elements at all speeds.

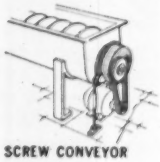
7 **Tie Rod** and turnbuckle serve as anchor and facilitate V-belt or chain adjustment.

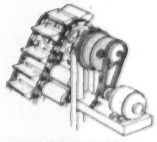
Write to Department 247 for engineering bulletin, including selection and dimension details.

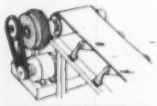
A FEW TYPICAL APPLICATIONS

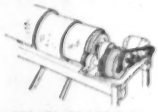

APRON FEEDER

LINE SHAFTING


SCREW CONVEYOR


BUCKET ELEVATOR


BELT CONVEYOR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- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

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ASM PROGRAM

Physical Constants, Crystal Structure and Thermodynamic Properties—J. F. Smith, U. S. Atomic Energy Commission.

Atomic Structure of Thorium, Its Electron Energy and Other Considerations as to Solid State Physics—T. G. Berlincourt, Atomics International.

Preferred Orientation in Thorium—L. K. Jetter and Carl J. McHargue, Oak Ridge National Laboratory.

Fabrication and Cladding of Thorium Metal—John H. Frye and Jack Cunningham, Oak Ridge National Laboratory.

Recrystallization and Grain Growth in Thorium Metal — Edward J. Boyle, Electro Metallurgical Co.

Mechanical Properties of Thorium Metal and High-Thorium Alloys—John Milko and Robert E. Adams, Oak Ridge National Laboratory.

Corrosion Resistance of Thorium Metal and High-Thorium Alloys—H. A. Pray and associates, Battelle Memorial Institute.

Metallography of Thorium—Harriet P. Roth, Nuclear Metals Inc.

Irradiation Damage in Thorium Metal—Frank G. Foote, Argonne National Laboratory.

Thorium Alloy Systems—H. A. Saller and Frank A. Rough, Battelle Memorial Institute.

Hazards Associated with Thorium Metallurgy—Adolph Voigt and Milo Voss, U. S. Atomic Energy Commission.

EFFECT of RESIDUAL ELEMENTS OF THE PROPERTIES of METALS

Monday, Oct. 8-10:30 a.m.

All Sessions in Hotel Statler

Fundamental Considerations (Structure—formation of a second phase effect of soluble elements and second phases upon properties)—E. R. Parker, University of California.

Monday, Oct. 8—2 p.m.

Nonferrous Structural Alloys (Aluminum, magnesium, copper and nickel)—F. N. Rhines, Carnegie Institute of Technology.

Tuesday, Oct. 9—9:30 a.m.

Iron and Steel—J. W. Halley, Inland Steel Co.

Semiconductors (Silicon, germanium and others)—J. H. Scaff, Bell Telephone Laboratories. (To be presented in Mr. Scaff's absence by W. G. Pfann).

Tuesday, Oct. 9—2 p.m.

Refractory Alloys (Titanium, molybdenum, zirconium and chromium)—D. J. McPherson, Armour Research Foundation.

FATIGUE ENDURANCE of CARBURIZED STEEL

(Staff members in the Metallurgy Section of General Motors Research Center will deliver the five lectures.)

ROLOCK

FABRICATED ALLOYS

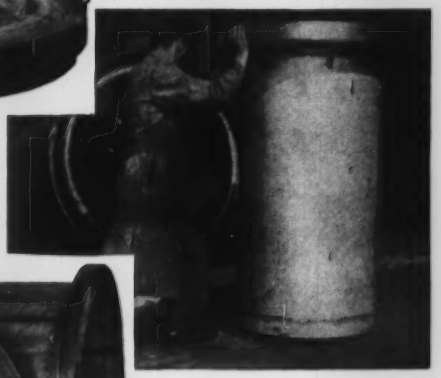
HEAT AND CORROSION RESISTANT

Engineered

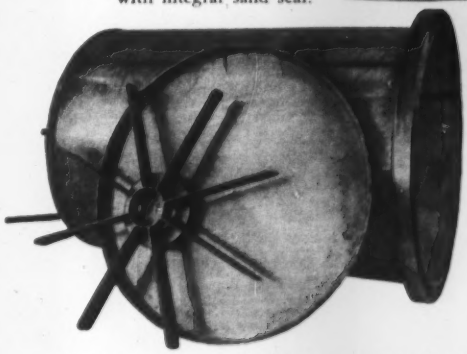
FURNACE RETORTS

that SERVE BETTER
LAST LONGER
COST LESS
per furnace hour

Stainless steel hoods for bell-type bright annealing furnaces. 77" O.D. x 88" high.



A special and very successful Rolock design with integral sand seal.



A special design built within a few days without costly patterns.

Here are three of the important furnace retort designs currently fabricated by Rolock specialists . . . each making an impressive record of excellent, low-cost service. Essential features include experienced design and construction engineering . . . unique Rolock know-how and experience in fabricating modern high-heat-resistant wrought alloys . . . quality standards maintained and safeguarded by detailed X-ray and other forms of inspection. Write for our new comprehensive catalog, or send your prints for quotation.

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SYNCHRO-

CONVENTIONAL FLASH WELDING

requires a separate flash trimming operation

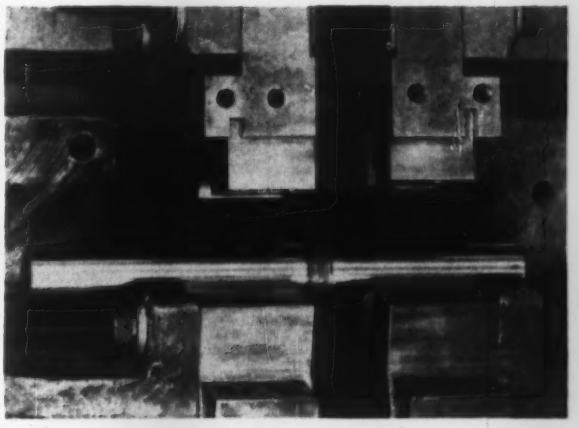
THOMSON "SYNCHRO-SHEAR"

no trimming required

A conventional flash weld, as shown at the left above, requires a separate operation to remove the flash extrusion. The cost of removing the flash in a flash trimmer, or by grinding, chiseling or flame cutting, usually exceeds the cost of making the weld.

A "Synchro-Shear" flash weld, as shown at the right, requires no trimming. Because the flash is trimmed as the weld is made, no further clean-up is necessary. Even when appearance is critical, finishing time is greatly reduced.

—SHEAR



Synchro-Matic Flash Welding with Automatic Flash Shear-Off

A MAJOR DEVELOPMENT IN FLASH WELDING STEEL ...ELIMINATES FLASH CLEAN-UP, SAVES HOURS OF FINISHING

Here, at last, is a flash welder for steel products that trims the flash while it makes the weld. It eliminates the need for separate flash trimmers — saves hours of cleaning up the flash extrusion or grinding away the upset.

Synchro-Shear, an exclusive THOMSON development*, adds automatic flash shearing to the proven performance of *Synchro-Matic* Flash Welders. Now you can flash weld carbon steel from mild to 1.00 carbon, high speed steel, high alloy steel and stainless steel, with speed, consistency and excellent weld quality while eliminating slow and costly post-weld clean-up. Synchro-Shear will weld and remove the flash from these materials in rectangular, round or irregular shapes.

Synchro - Shear Flash Welders are available in a complete family of RWMA sizes, tooled to suit your product. Write for complete information.

*"Pinch-Off Dies," now in wide use for removing the flash while welding aluminum, copper and other soft materials, are another Thomson development.

SEE SYNCHRO-SHEAR IN ACTION...
Booth 1751 — METALS SHOW, Cleveland, October 8 - 12

FOUNDED IN 1886 BY ELIHU THOMSON

INVENTOR OF RESISTANCE WELDING

THOMSON *Welders*

THOMSON ELECTRIC WELDER COMPANY
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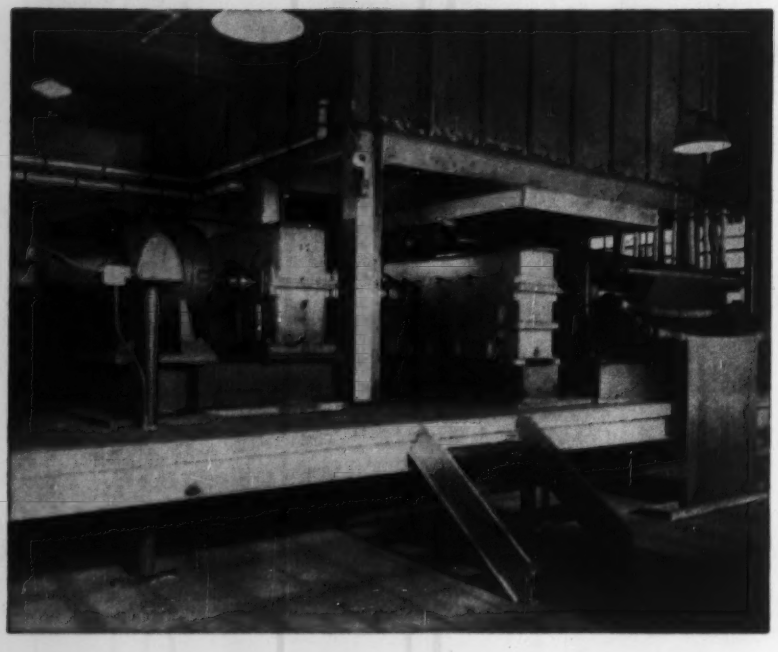
Thomson makes a complete line of standard spot, projection, seam and flash-butt welders. Also, aircraft, brake shoe, fabric and other special purpose resistance welders.

Lee Rubber and Tire Corp. increases tire strength... speeds production with **H & S** speed reducers!



To satisfy demand for larger, heavy-duty tires, the tire industry found that Nylon cord tension must be increased. Lee Rubber and Tire Corp. solved this problem with the help of H & S engineering. At their Conshohocken, Pa. plant two new drive units consisting of a 125 H.P. motor, an H & S LD-3600 speed reducer and a special H & S seven shaft roll drive were installed.

Now 1200 to 1920 strands of Nylon pass through the tensioning cycle at a speed of 180 fpm. As the fabric leaves the "hold back roll" run at a constant speed, it passes through a temperature of 400°F for proper heat treating. H & S powered "pull up rolls" can exert a tension from 0 to 20,000 lbs. (Older drives were limited to a tension of approximately 1500 lbs.)

The result—greatly increased tension capacity enables the Lee Rubber and Tire Corp. to "set" the Nylon cords limiting growth in tire use to 2 or 2½%. (Formerly cord growth amounted to as much as 14%). Improved tire quality and faster production were achieved.

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GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

Send note on Company Letterhead for complete H & S Catalog

ASM PROGRAM

Thursday, Oct. 11—9:30 a.m.

Introduction—J. B. Bidwell.
Physical Metallurgy of Carburized Steel—G. H. Robinson.

Thursday, Oct. 11—2 p.m.

Residual Stresses in Carburized Steels—W. S. Coleman.
Fatigue Durability of Carburized Steels—R. L. Mattson.
Summary—R. F. Thomson.

American Welding Society

John J. Chyle
President

TECHNICAL PAPERS

Monday, Oct. 8—2 p.m.

Hotel Cleveland

STRUCTURES

Behavior of Welded Built-Up Beams Under Repeated Loads—J. E. Stallmeyer, W. H. Munse and B. J. Goodal, University of Illinois.
Welded Open-Web Expanded Beams—M. Altfillisch, B. R. Cooke and A. A. Toprac, University of Texas.
Welded Reinforcement of Openings in Structural Steel Tension Members—R. A. Hechtman, and D. D. Vasarhelyi, University of Washington.

WELDABILITY and RESEARCH

Notch Toughness Characteristics of Submerged-Arc Weld Deposits—I. L. Stern, N. A. Kahn and H. Nagler, New York Naval Shipyard.
Effect of Metallurgical Variables on Transition Behavior in Charpy Slow-Bend and Impact Tests—C. F. Hartbower, Watertown Arsenal Laboratories.
Mild-Steel Weld-Metal Porosity—R. D. Stout, Lehigh University, and J. T. Ballass, Electric Boat Division of General Dynamics Corp.

INERT ARC WELDING

Factors Affecting Melting Rate of Gas-Shielded Metal-Arc Welding—A. Lesnewich, Air Reduction Co. Inc.
Shielding Gases for Inert-Gas Welding—W. H. Helmbrecht and G. W. Oyler, Linde Air Products Co.
Inert-Gas Metal-Arc Welding of High Pressure Valves—F. R. Zacheus, Air Reduction Sales Inc.

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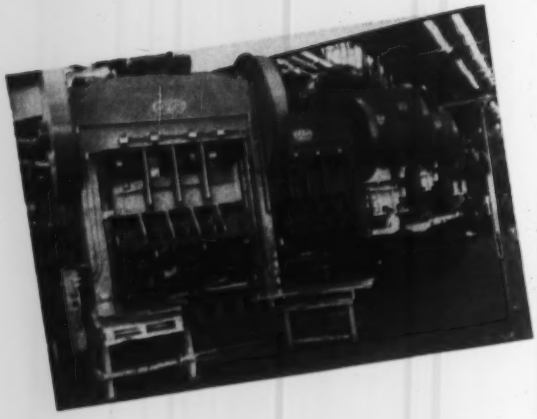

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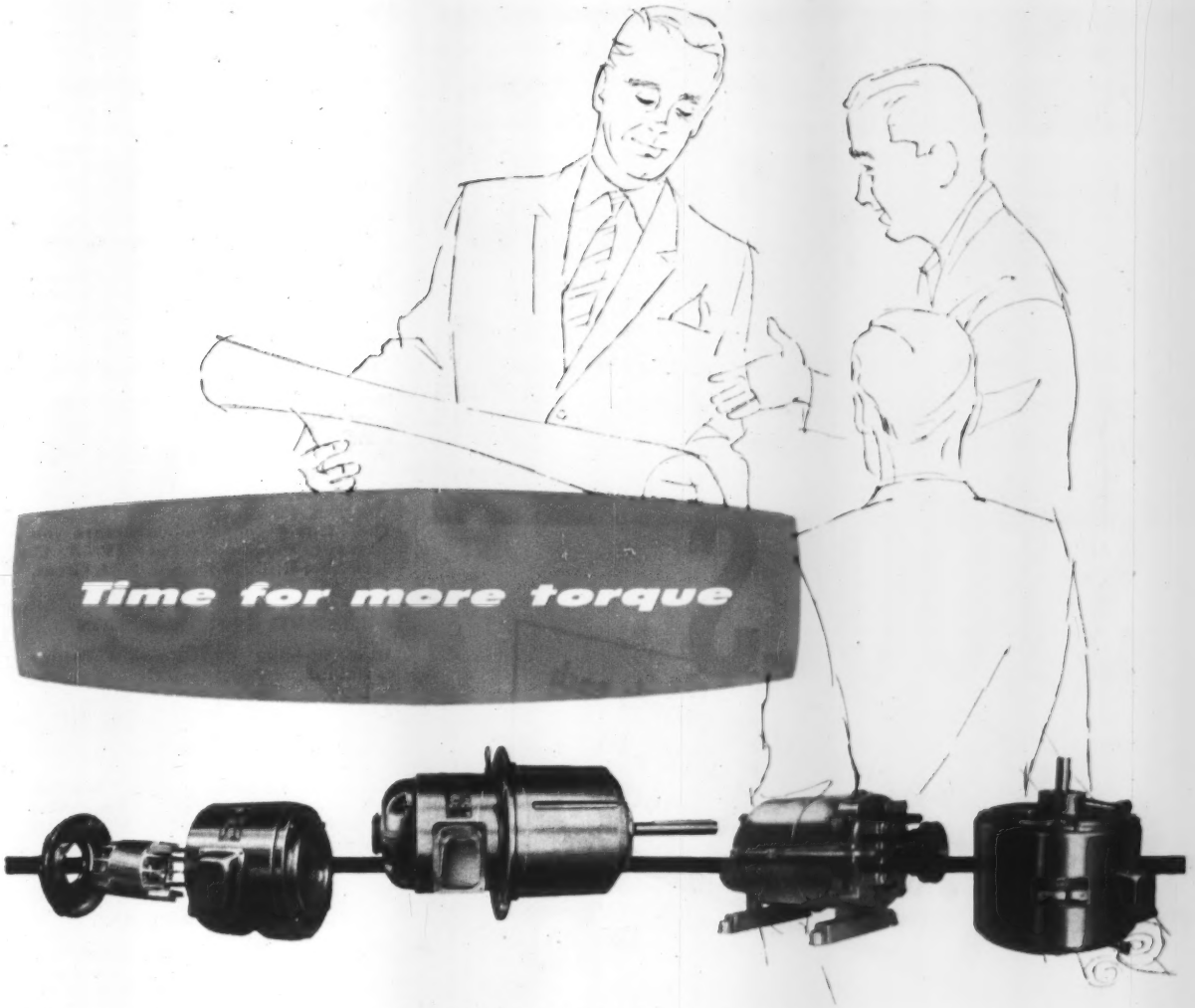

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AWS PROGRAM

Tuesday, Oct. 9—9:30 a.m.

AIRCRAFT

Design Requirements for Fusion Welding Titanium in Aircraft Applications — R. Meredith, North American Aviation.

Fusion Welding of Magnesium Thorium Alloys—F. K. Lampson, Marquardt Aircraft.

Weld Planishing Improves Production of Aircraft Parts—H. L. Meredith, Airline Welding & Engineering Co.

WELDABILITY and RESEARCH

Brittle Fracture Initiation Tests—C. Mylonas and D. C. Drucker, Brown University.

Brittle Fracture Propagation in Wide Steel Plates—W. J. Hall, R. J. Mosborg and V. J. McDonald, University of Illinois.

The Effect of Microstructure on Notch Toughness—Part IV—J. C. Danko, R. D. Stout and J. H. Gross, Lehigh University.

DESIGN and INSPECTION

How Welding Can Further Bridge Building Progress—O. Blodgett, Lincoln Electric Co.

Industrial Radiography by Gamma Ray Projection from Radioactive Isotopes—C. M. Dick, Metal & Thermit Corp.

Greater Acceptance of Welding Through the Use of Inspection Methods—J. R. Harren, Magnaflux Corp.

Tuesday, Oct. 9—2 p.m.

INERT-ARC WELDING

Selection of Proper Inert-Gas-Shielded Arc-Welding Process—C. J. Sullivan and I. D. Holster Jr., Air Reduction Sales Co.

Consumable - Electrode Inert - Gas Welding with Small-Diameter Wires—K. E. Richter and J. F. M. Essig, Linde Air Products Co.

Inert-Gas-Shielded Metal-Arc Spot Process—J. W. Kehoe and H. J. Bichsel, Westinghouse Electric Corp.

TITANIUM

An Investigation of the Weldability of Ti-6%Al-4%V—D. M. Daley Jr. and C. E. Hartbower, Watertown Arsenal Laboratories.

Problems Involved in Spot Welding Titanium to Other Metals—F. W. McBee Jr. and J. H. Henson, Defense Research Laboratory, and L. R. Benson, University of Texas.

Effects of Interstitial Elements on Welds in Alpha Beta Titanium Alloys—W. J. Lewis, M. L. Kohn, G. E. Faulkner and P. J. Rieppel, Battelle Memorial Institute.

SYMPOSIUM ON METALLIZING

Panel Discussion sponsored by the AWS Committee on Metallizing.

Surfacing and Build-Up—R. J. McWaters, Metallizing Engineering Co. Inc.

Ceramic Coatings—A representative of the Norton Co.

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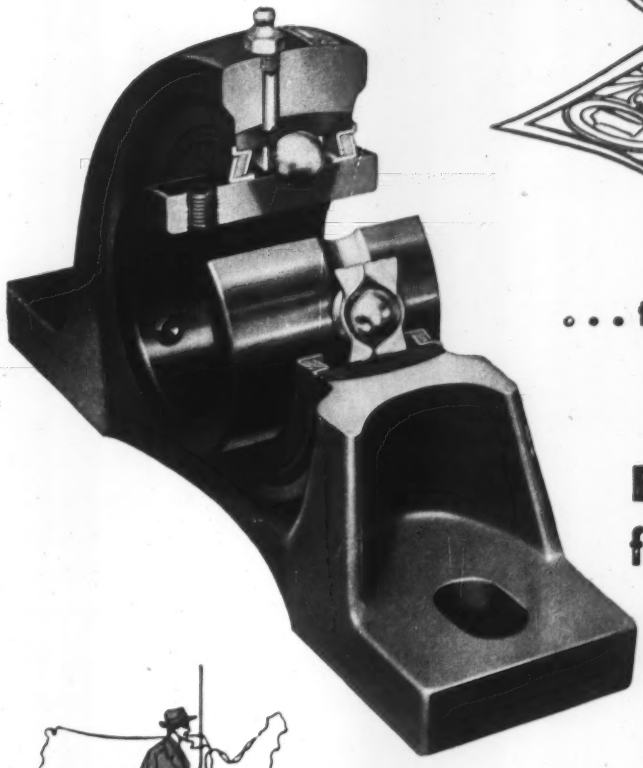

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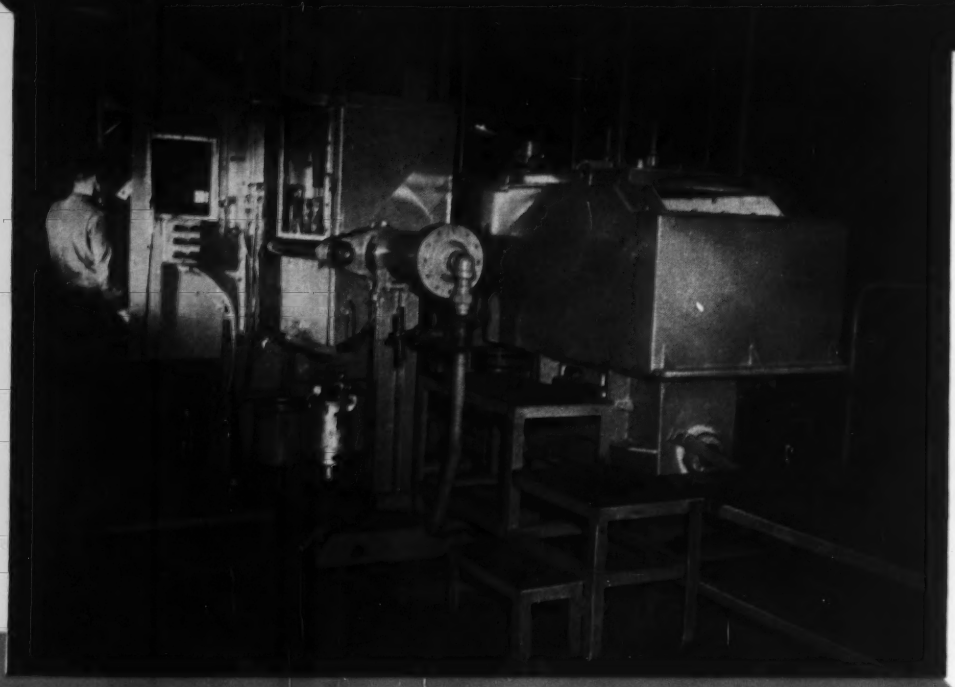

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PRODUCTION: Up to 500 pounds per hour (Special units available for higher ratings)

CASTING SIZE: ½ pound to 20 pounds

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AJAX ELECTRIC CO., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

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Corrosion—E. T. Englehart, Aluminum Research Labs.
Combination Coatings—C. J. Breitenstein, Metal-Cladding Inc.

Wednesday, Oct. 10—9:30 a.m.

BRAZING and SURFACING

Silver Brazing Lap Joints in Stainless Steel Tubing—G. H. Bohn, Linde Air Products Co.
Basic Characteristics of Some Heat-Resistant Brazing Filler Materials—W. Chang, General Electric Co.
Longer Service Life Through Hard Facing for Petroleum Industry Equipment—H. S. Gonser, Wall Colmonoy Corp.

FILLER METAL

A New Nodular Cast-Iron Welding Rod for Foundries and Fabricators—R. O. Day, J. S. Snyder and H. V. Inskeep, Linde Air Products Co.
Coating Ingredients Influence on Surface Tension, Arc Stability and Bead Shape—T. H. Hazlett and Earl R. Parker, University of California.
Electrode Control in an Alloy Pressure Vessel Plant—H. H. Weber, Colonial Iron Works Co.

PIPING and PIPELINES

Status of Efforts To Develop Mechanized Pipeline Welding Methods—P. S. Reed, *Oil & Gas Journal*.
Automatic Welding of Piping—H. Thielsch and E. R. Jerome Jr., Grinnell Co. Inc.
Automatic Welding Applications at the Whiting Refinery—R. C. Wheeler and R. M. Kolb, Standard Oil Co. (Indiana).

Wednesday, Oct. 10—2 p.m.

RESISTANCE WELDING

Recent Developments in Magnetic Force Welding—M. J. Funk, Precision Welder & Flexopress Corp.
Regulated and Programmed Resistance Welding Control Systems—C. Sinclaire, General Electric Co.
Finish Mash Seam Welding—M. L. Begeman and W. J. Allen, University of Texas.

STAINLESS STEEL

Properties of Austenitic Chromium-Manganese Stainless-Steel Weld Metal—H. T. DeLong and H. F. Reid, McKay Co.
The Plastic Ductility of Welded Joints in Austenitic-Steel Piping at 1200°F—R. W. Emerson and R. W. Jackson, Pittsburgh Piping & Equipment Co.
Further Studies on Stainless-Steel Hot Cracking—H. Rischall and P. P. Puzak, Naval Research Laboratory.

PRESSURE VESSELS

Fabrication of Inert-Gas Welded Aluminum Tanks and Pressure Vessels—R. J. Frantz and Amel R. Meyer, Graver Tank & Mfg. Co.
The Properties of Pressure-Vessel Steels in Heavy Sections—J. H. Gross and R. D. Stout, Lehigh University.

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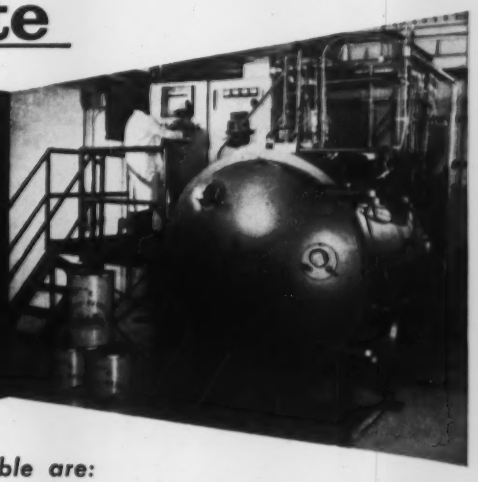
VACUUM MELTING service and UltraMet alloys...



Now available are:

stainless, tool and die, magnetic steels—high-temperature, corrosion-resistant, expansion alloys—bearing steels—electrical and electronic alloys—special alloys

RIGHT NOW . . . Cannon-Muskegon provides you with a ready source of super-clean, superior strength alloys to meet complex metallurgical applications. Our completely equipped and expertly staffed vacuum melting facilities as well as chemical, physical and metallurgical laboratory can help you *find, test and produce* vacuum melted alloys for any application . . . in test or production quantities . . . with accurately predictable properties.

Ferrous, nickel and cobalt-base alloys are poured at pressures from 1 to 10 microns — resulting in extremely clean metals for smoother surfaces . . . greater tensile strength, ductility and wear life . . . and higher electrical and magnetic properties. Contact Cannon-Muskegon for facts.

We offer industry

- *Materials for remelt*— under conventional air melting, inert gas, vacuum.
- *Casting development*— includes research and experimental facilities for investment, shell mold, dry sand, and permanent mold castings.
- *Ingots or cast billets*— for rolling, forging or extruding in individual weights up to 250 pounds.

Finest laboratory and production equipment is used in our vacuum-melting operation . . . available to you. Let our metallurgical specialists help you solve your alloy problem.

For full particulars write for our New Bulletin on Vacuum-Melting and Air-Melting facilities, products and service.

ULTRA MET
VACUUM-MELTED ALLOYS FOR INDUSTRY

CANNON-MUSKEGON CORPORATION
2893 Lincoln Street Muskegon, Michigan
METALLURGICAL SPECIALISTS

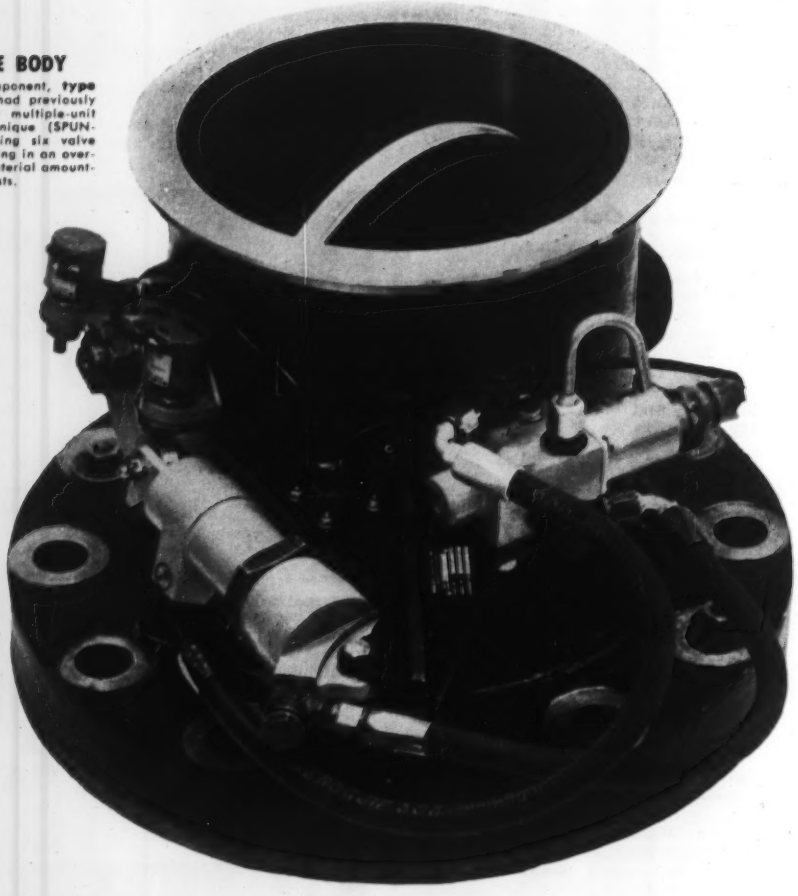
VALVE LINKAGE LEVERS

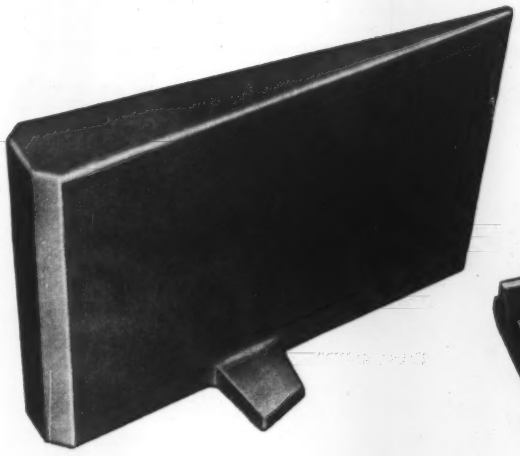
Small parts are no problem. These ESCO SHELLCAST corrosion resistant alloy steel type 317, A296-49T, CF-8M, valve linkage levers weigh less than two ounces each.

Before you say, "It can't be cast,"

BUTTERFLY VALVE BODY

This guided missile component, type 304, A296-49T CF-8, had previously been fabricated. ESCO multiple-unit centrifugal casting technique (SPUN-CAST®) was used, casting six valve bodies at one time resulting in an overall saving in time and material amounting to 30% of former costs.





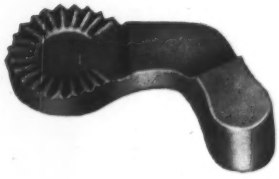
HEAT-TREATING VANE TIP

ESCO SHELLCAST in a heat resistant weldable alloy, type 302B, A297-49T HF, eliminated all former machining.

CAN CONVEYOR LINK

ESCO SHELLCAST eliminates difficult machining operations on carbon steel conveyor link used in food plant.

call an *ESCO* Engineer...



ESCO alloy steel castings can make your designing *easier*. You get the part you want, in the alloy you need and in the shape that saves you the most fabricating, machining and finishing time . . . ***PLUS***

METALLURGICAL ENGINEERING AND RESEARCH

ESCO maintains one of the largest and best equipped metallurgical staffs of any alloy steel foundry . . . ***PLUS***

PRODUCT ENGINEERING AND DESIGN

An integrated service at all levels; in the field, at the drawing board and in the foundry . . . ***PLUS***

FOUNDRY FACILITIES AND CASTING EXPERIENCE

A casting service that covers the complete range of alloy steel casting methods for all applications . . . ***PLUS***

LABORATORY INSPECTION AND TESTING

ESCO laboratory technicians are qualified and equipped to perform all types of inspections and testing to the most rigid specifications.

Write today for your FREE copy of this informative 100-page reference book—"*ESCO* Alloy and Stainless Steels for the Process and Manufacturing Industries".

Call an *ESCO* Engineer — let him show you how *ESCO* Alloy Steel Castings can help make your designing easier.

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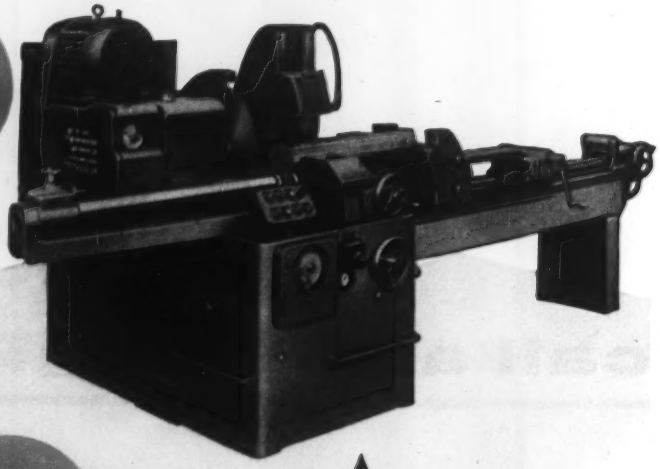
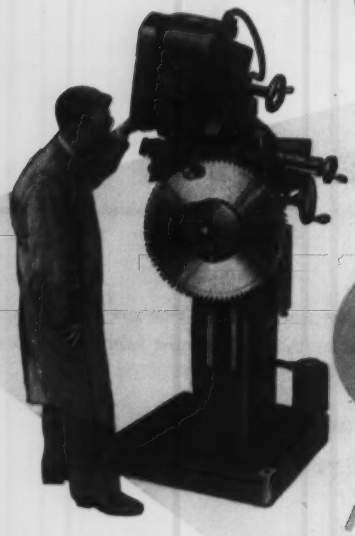
THE Triple-Chip METHOD IS A Triple-threat TO HIGH CUTTING COSTS

CIRCULAR SAWING MACHINES



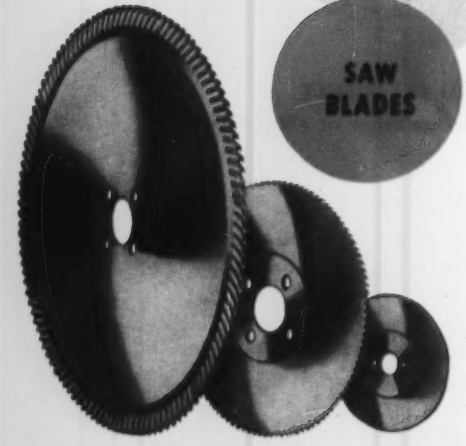
The No. 2-8 machine for cutting off solid metal up to 8" square.

SAW BLADE SHARPENERS



The G-45 sharpener for blades 8" through 48" diameter.

SAW BLADES



M. & M. saw blades cut any machinable metal. Cut-off blades: segmental — 11" through 120" diameter; solid — 8" through 20" diameter. Slitting saws — 3" through 8" diameter.

You may profit immensely by applying the M. & M. Triple Threat to *your* cut-off costs. Machine, blade, and grinder, made by the first company to build all 3, often effect phenomenal savings, as proved by detailed case studies. *Just such a study of your job is yours for the asking.* We offer you an unmatched experience in the sawing of any machinable metal, round, square or structural shapes, from 1/4" through 43" diameter.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

Investigation of a Pressure Vessel Failure—J. Heuschkel, Westinghouse Research Laboratories.

Thursday, Oct. 11—9:30 a.m.

WELDING and CUTTING

Aspects of Crack Sensitivity in Machinable Cast-Iron Deposits on Cast Iron—J. Broderick, Practical Welding Research Laboratory, and R. D. Wasserman, and J. F. Quaas, Eutectic Welding Alloys Corp.

Fundamental Concepts of Oxygen Cutting—R. L. Stoecker and H. B. Moen, Air Reduction Co. Inc.

Transverse Cracking Resulting from Oxygen Cutting—N. N. Breyer, Continental Foundry & Machine Division of Blaw-Knox Co.

ALUMINUM

Chlorine Additions in Inert Gas Metal-Arc Welding of Aluminum— A. R. Pfluger, Kaiser Aluminum & Chemical Corp., and L. A. Cook, Ravenna Metal Products Inc.

The Thermal Stability of Cold Butt-welds in Aluminum and Copper—W. H. Bruckner and J. H. Sayles, University of Illinois.

Fabricating Aluminum with Other Metals—K. V. Lutz, All-State Welding Alloys Co. Inc.

PIPING and TUBING

Study of Interrupted Welding of Heavy-Wall Steam Pipe—I. A. Rohrig and J. O. Smith, Detroit Edison Co.

Welding Heavy-Wall Carbon-Steel Pipe with CO_2 Shielding Gas—A. B. Dunning, General Electric Co.

The Effects of Zinc Phosphate Coating on Flash Welding of Steel Tubing—J. F. Young and A. Phillips, Douglas Aircraft Co. Inc.

Friday, Oct. 12—9:30 a.m.

MOLYBDENUM and ZIRCONIUM

Ductility of Tungsten Arc Welds in Molybdenum—R. N. Monroe, N. E. Weare and D. C. Martin, Battelle Memorial Institute.

The Influence of Nitrogen on the Ductility of Molybdenum Welds—W. N. Platte, Westinghouse Electric Corp.

Notch Slow-Bend Testing of Zirconium and Zircaloy-2—R. G. Wheeler, General Electric Co.

PROCESSES

The Motor Arc Welding Process—C. C. Stone and R. A. Noland, Argonne National Laboratory.

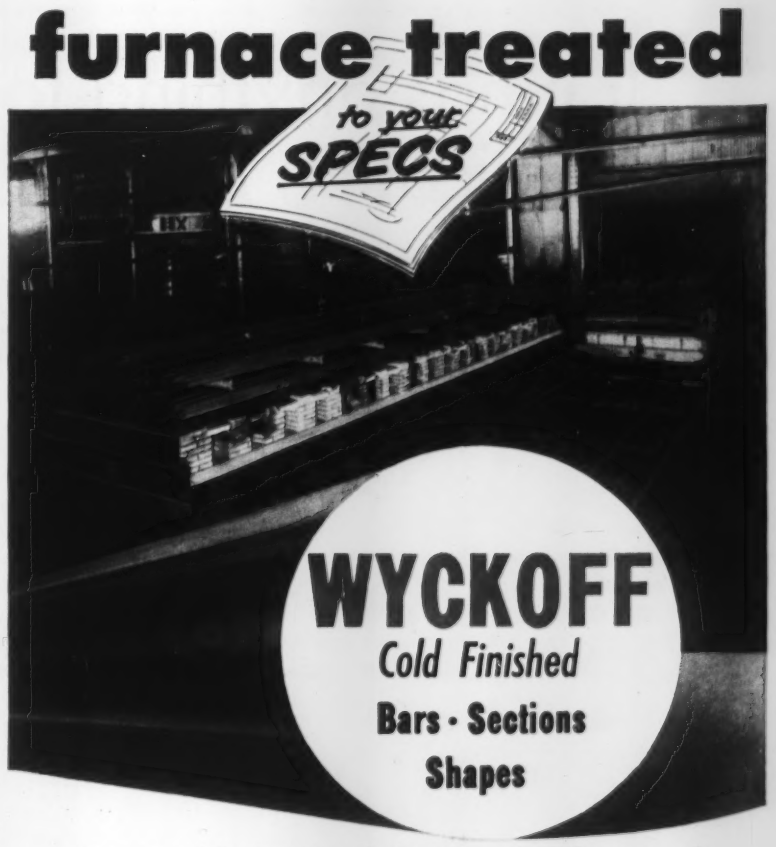
High-Frequency Continuous Seam Welding of Ferrous and Nonferrous Tubing—H. B. Osborn Jr., Ohio Crankshaft Co., Tocco Division.

Developed Procedures for the Flexible Electrode Submerged Arc Welding Process—M. H. Fritsche, Westinghouse Electric Corp.

SHOP MANAGEMENT

Organization of Shop Management for Quality Welding—W. B. Bunn, M. W. Kellogg Co.

Maintaining Workmanship Standards for Quality Welding—Howard Cary, Marion Power Shovel Co.



Have you fully investigated the cost-saving advantages of furnace treated cold finished steels? For a number of years WYCKOFF has been saving time and money for industry's leading buyers through highly specialized pre-treatment of steel to produce exact and unvarying working characteristics.

One of our metallurgists will be glad to discuss this service as applied to your production requirements.

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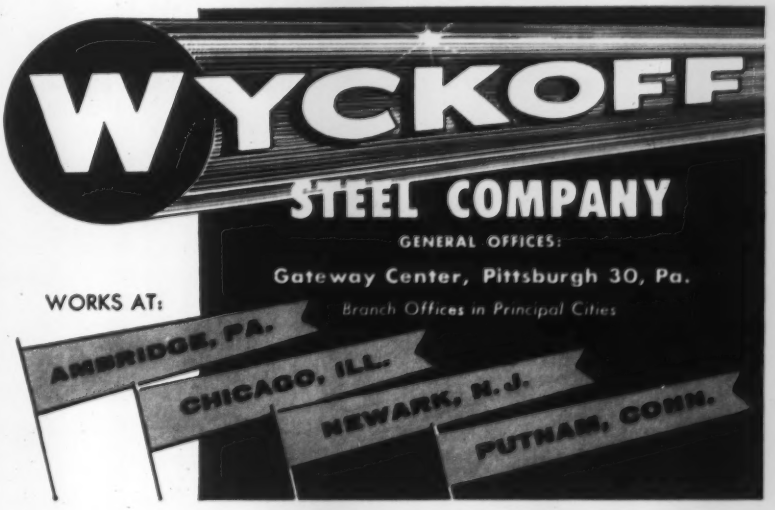
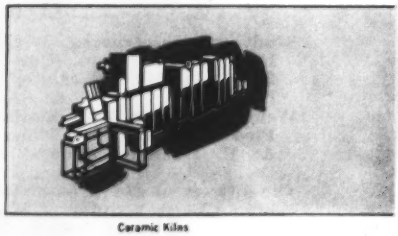
Carbon, Alloy and Leaded Steels • Turned and Polished Shafting
Turned and Ground Shafting • Wide Flats up to 14"
All types of furnace treated Steels

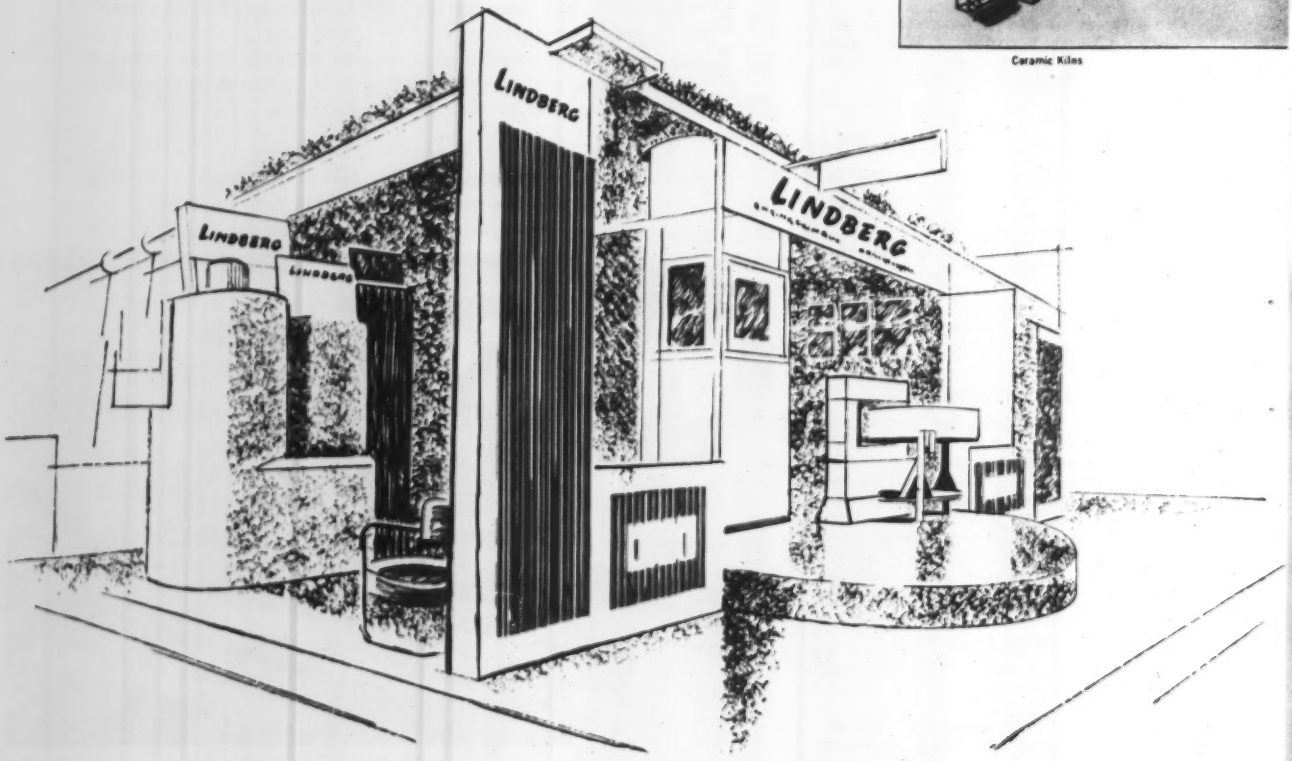


If it has anything to do with the application of heat to Industry. . . .

When you're at the Metal Show in Cleveland, please make it a point to visit headquarters for "Heat For Industry," the Lindberg exhibit in Booth 431. All our top people will be there, engineers, metallurgists, experts in every phase of industrial heat applications. It's quite possible that they can come up with the answer to some of your problems in this field. The latest Lindberg equipment will be shown and, particularly, we'll unveil for the first time a brand-new development in furnaces that we're confident will fill an important place in the heat treating field. Whatever your job may be, if it has anything to do with the application of heat to industry, it's worthwhile talking to Lindberg. So see us at the Show!



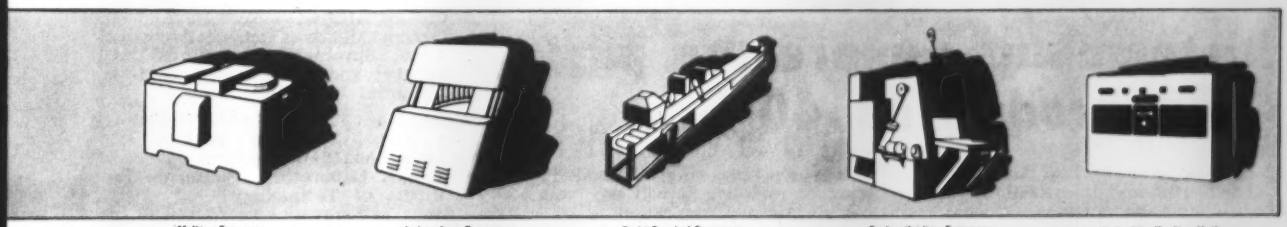
Ceramic Kilns



. . . . . BETTER TALK IT OVER WITH

LINDBERG

The safest way to be sure that you have the right answer for any application of heat to industry is to talk it over with the most widely experienced experts you can find. We believe we have them here at Lindberg. Our business is concerned only with the development of industrial heating equipment and we manufacture the most complete line in the field; heat treating furnaces, melting furnaces, high-frequency induction units, ceramic kilns; big ones, small ones, electric or fuel-fired, built in our plant or field-erected. Before you decide on any application of heat to industry, it's reassuring to know you have the right answer. Talk it over with Lindberg.



Melting Furnaces | Laboratory Furnaces | Field-Erected Furnaces | Carbonitriding Furnaces | Induction Heating Units

Here are some specific advantages you get only when you come to Lindberg:

- An organization of experts concentrating only on the development of industrial heating equipment.
- The most *complete* line of equipment insuring the recommendation of exactly the right methods for your specific product requirements and production processes.
- Research and development laboratories which have originated and perfected many important heating methods and processes. Among these are the Cyclone tempering furnace, automatic control of carbon potential in furnace atmosphere . . . 60 cycle induction melting . . . completely automatic ceramic kilns . . . the "Iron Lung" for treating stainless steel . . . vertical replaceable radiant tubes . . . CORRTHERM electric heating elements and many other innovations in the industrial heating field.
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- A world-wide organization of subsidiary companies, making available to Lindberg the latest developments in heat applications in foreign industry.
- A group of technically-trained Field Representatives located in fifteen industrial centers in the United States. There's a trained Lindberg man just as close as your telephone.

You can't afford not to get the best advice possible on your industrial heating problems. We are confident our experience can be helpful to you. Why not talk it over with Lindberg?

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Ask Standard

how to cut costs with conveyors

Standard gravity roller conveyors like this are modest in cost, easy to install and maintain.

Conveyor system helps Airtemp up compressor parts production 40%

To handle stepped-up demands for residential and industrial air conditioners, the Airtemp Division of the Chrysler Corporation undertook an extensive re-tooling program. On one compressor crankcase line, for example, they installed 17 new machine tools . . . connected them all with Standard gravity roller conveyors. Result — two hours saving per case, production up 40%.

If you're planning on modernizing or retooling it will pay you, too, to find out how Standard conveyors can complement new equipment . . . give you lower overall costs and greater productive efficiency. STANDARD CONVEYOR COMPANY, North St. Paul 9, Minnesota. Sales and Service in Principal cities.

To expedite shipping or stocking and reduce handling costs, investigate Standard lightweight portable roller conveyors (right) or the portable, self-powered HANDIBELT conveyor (left), which can be used horizontally or at varying incline or decline angles.

For details — contact the Standard representative listed in the classified phone book or write direct. Ask for Bulletin Y-10.

Standard 50 years of conveyor specialization

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Institute of Metals Division AIME

Carl E. Reistle Jr.
President

Monday, Oct. 8, 9 a.m. to 12 noon

HOTEL CARTER Petit Cafe

RESEARCH IN PROGRESS

Chairmen—C. D. Cullity and Paul Gordon.

9 a.m. to 12 noon, Grand Ballroom

RESEARCH SEMINAR ON EMBRITTLEMENT

Chairmen—W. R. Hibbard Jr. and J. P. Nielsen.

Effect of Hydrogen on Alpha Titanium Alloys—G. A. Lenning, Titanium Metals Corp. of America; J. W. Spretnak, Ohio State University; and R. I. Jaffee, Battelle Memorial Institute.

Upper-Nose Temper Embrittlement of a Nickel-Chromium Steel—L. D. Jaffe and D. C. Buffum, Jet Propulsion Laboratory, California Institute of Technology.

On the Nature of Embrittlement Occurring While Tempering a Nickel-Chromium Alloy Steel—G. Bhat, Crucible Steel Co. of America, and J. F. Libsch, Lehigh University.

Observations on the Mechanical Properties of Hydrogenated Vanadium—B. W. Roberts and H. C. Rogers, General Electric Co.

Effect of Small Amounts of Alloying Elements on the Ductility of Cast Molybdenum—L. E. Olds and G. W. P. Rengstorff, Battelle Memorial Institute.

Monday, Oct. 8, 2 to 5 p.m.

Grand Ballroom

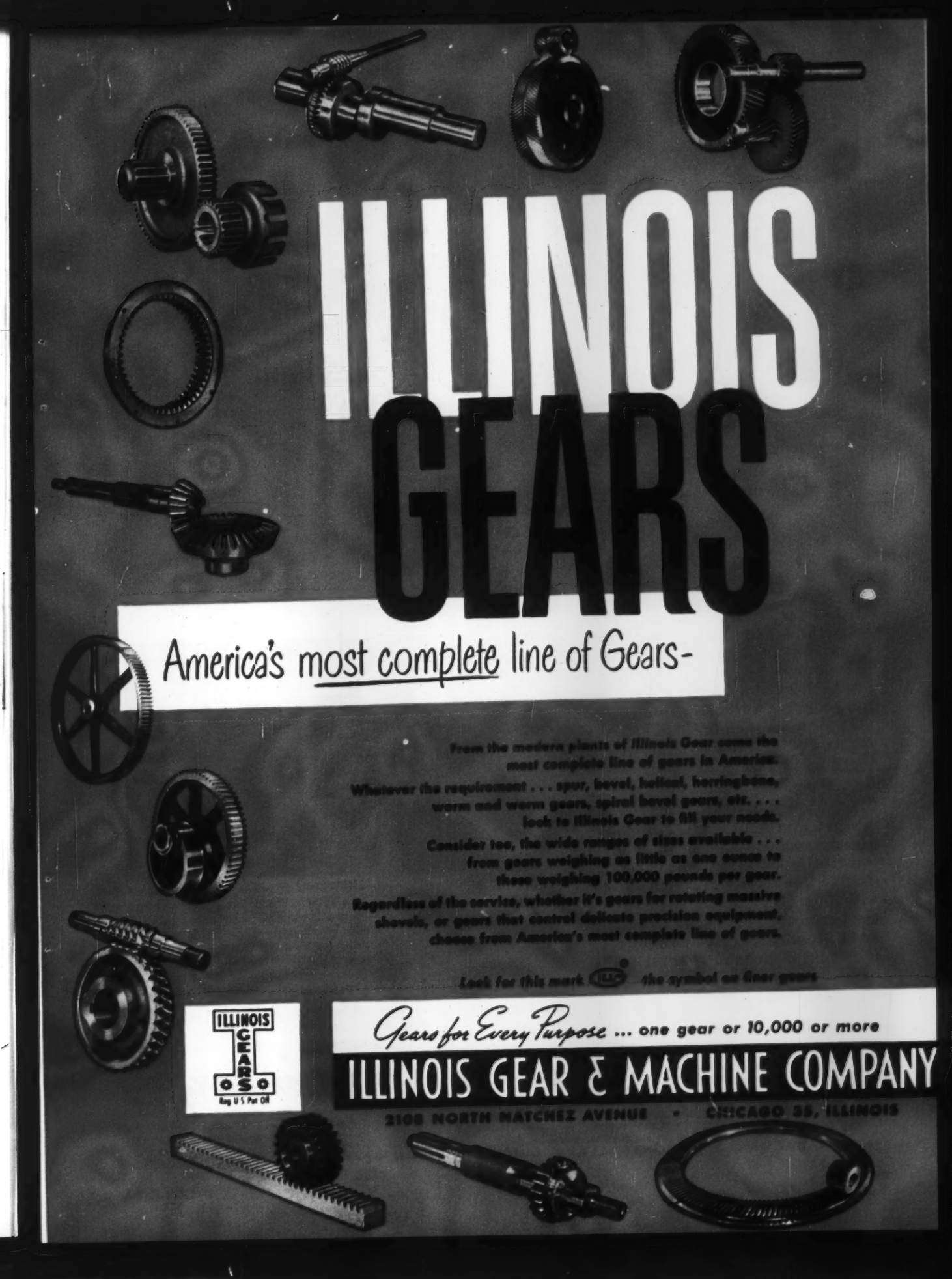
SYMPOSIUM ON NUCLEAR METALLURGY

Chairmen—Edward Epremian and A. E. Kaufman.

Theory and Mechanism of Radiation Effects in Metals—G. H. Vineyard, Brookhaven National Laboratory.

Irradiation Effects on Physical Metallurgical Processes—D. E. Thomas, Westinghouse Electric Corp.

Irradiation Effects in Reactor Materials—Douglas Billington, Oak Ridge National Laboratory.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GEARS
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From the modern plants of Illinois Gear come the most complete line of gears in America.
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Consider too, the wide ranges of sizes available . . . from gears weighing as little as one ounce to those weighing 100,000 pounds per gear.
Regardless of the service, whether it's gears for rotating massive shovels, or gears that control delicate precision equipment, choose from America's most complete line of gears.
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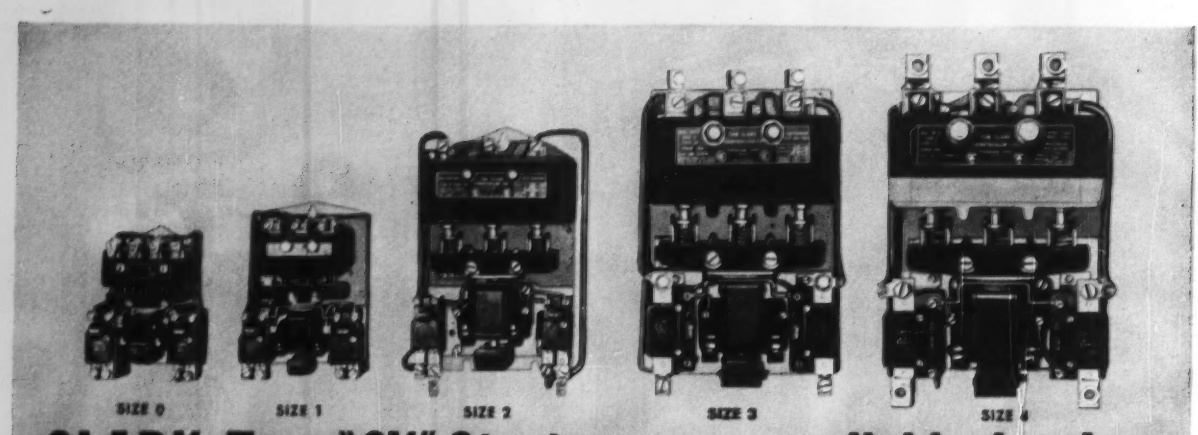
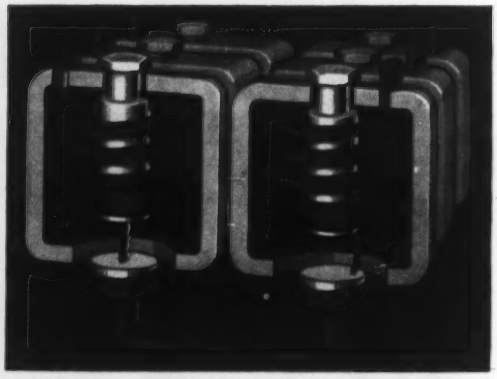


CLARK Type "CY" Starters now available in sizes

0 to 4

With the addition of the new size 4, the famous CLARK line of Type "CY" Magnetic Motor Starters now comprises the full range from 0 to 4. This means that Clark starters of the proven "CY" design incorporating vertical lift magnets are now available for more than 95% of industry's AC requirements. For installations requiring sizes 5 and larger, Clark will continue to supply dependable clapper-type starters.

Clark Type "CY" starters have many outstanding design features for more dependable operation, less maintenance and longer life. For example—rugged construction with twin-break contacts means more trouble-free service . . . contacts can be inspected without tools . . . movable and stationary contacts can be removed and replaced quickly, coils changed and the entire magnet assembly removed—all from the front—without special tools and without removing the starter from the cabinet or panel.



Revolutionary arc-quenching principle is an exclusive feature of all Clark Type "CY" starters sizes 2 and larger. It combines twin-break contacts with strong multi-turn magnetic blowouts which force the arc to rotate—alternately lengthened and confined—so that it moves continuously from a hot to a cold spot on the contact surfaces. This practically eliminates metal build-up or pitting and greatly increases contact life.

For complete information contact your nearest Clark sales office or write us direct.

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Engineered Electrical Control

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AIME PROGRAM

Monday, Oct. 8, 2 to 5 p.m.

Petit Cafe

RESEARCH SUMMARIES — MECHANICAL PROPERTIES

Chairmen—W. J. Harris Jr. and R. W. Fountain.

Influence of Silicon and Aluminum on the Properties of Hot-Rolled Steels—R. H. Frazier, F. W. Boulger and C. H. Lorig, Battelle Memorial Institute.

Creep of Polycrystalline Nickel—J. Weertman and P. Schahinian, Naval Research Laboratory.

Study of the Effect of Gases on the Melting, Casting, and Working of Palladium—R. H. Atkinson, (retired), International Nickel Co. Inc.

Ti-36% Al as a Base for High-Temperature Alloys—J. B. McAndrew, Armour Research Foundation and H. D. Kessler, Titanium Metals Corp. of America.

Effect of Mo, W, and V on the High-Temperature Rupture Strength of Ferritic Steel—A. E. Powers, General Electric Co.

High-Strength Zirconium Alloy: Zirconium + 4 w/o Tin + 1.6 w/o Molybdenum — Walston Chubb, Battelle Memorial Institute.

Creep of Single Crystals and Polycrystals of Aluminum, Lead and Tin—C. D. Wiseman, O. D. Sherby and J. E. Dorn, University of California.

Effect of Melting and Casting Atmospheres on the Stress-Rupture Properties of Cast Nickel-Base Alloys—C. M. Hammond and R. A. Flinn, University of Michigan.

Aging in Complex Commercial Nickel-Chromium Alloys Hardened with Titanium and Aluminum—R. F. Wilde, General Electric Co., and N. J. Grant, Massachusetts Institute of Technology.

Effect of Orientation on the Plastic Deformation of Aluminum Single Crystals and Bicrystals — R. S. Davis, R. L. Fleisher, J. D. Livingston and Bruce Chalmers, Harvard University.

Tuesday, Oct. 9, 9 a.m. to 12 noon

Petit Cafe

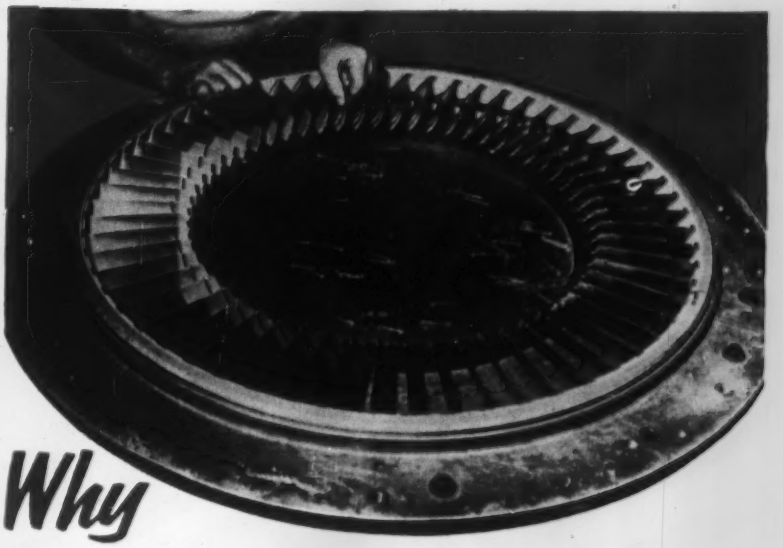
RESEARCH SEMINAR — CRYSTALLINE IMPERFECTIONS AND MECHANICAL BEHAVIOR

Chairmen — Jack Washburn and Robert Maddin.

Delayed Yielding in a Substitutional Solid Solution Alloy—L. A. Shepard and J. E. Dorn, University of California.

Control of Strain Aging in Alpha Iron—E. R. Morgan, Jones & Laughlin Steel Corp., and J. C. Shyne, Ford Motor Co.

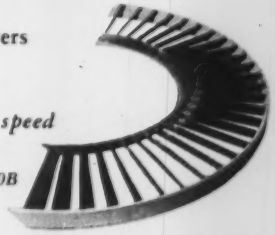
Recovery of Cold-Worked High-Purity Aluminum-Magnesium Alloys—E. C. W. Perryman, Atomic Energy of Canada Ltd.

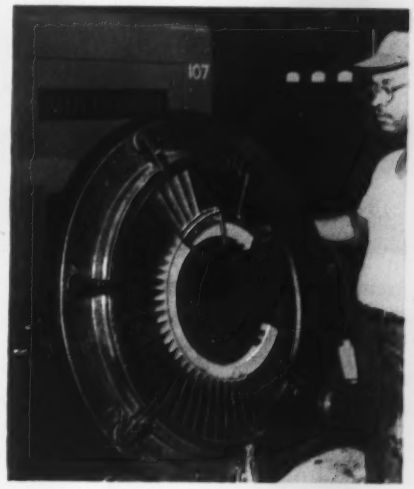


Why these stator blades for Curtiss-Wright J 65 jet engines are brazed with EASY-FLO*

Allis Chalmers does this job with EASY-FLO for the same reasons that a great many manufacturers use this low-temperature silver brazing alloy — namely — the *great strength* and *virtual indestructibility* of EASY-FLO joints – plus the *speed* and *economy* with which they can be produced.

**EASY-FLO meets SAE Aeronautic Materials Spec. AMS 4770B*





THEY USE THE EASY-FLO FAST BRAZING FORMULA

PREPLACING the alloy – plus a setup that speeds handling and heating – that's the formula. Top picture shows parts being assembled in circular fixture with clips of EASY-FLO wire being preplaced over blade ends. At left – as half of fixture rotates, inner end of shroud passes through induction heating coil section at top. Time cycle for completing a half (28 joints) is 10 minutes. Blades are *nickel steel* and shroud ring is *brass*. EASY-FLO is particularly effective in joining dissimilar metals. Average strength of joints is *double* the specified minimum pull of 2800 lbs.

GET FULL EASY-FLO FACTS AND DISTRIBUTOR LIST

BULLETIN 20 explains why high-strength, speed and economy are inherent in EASY-FLO brazing. Also gives useful information about joint design and fast brazing methods. A copy, with Distributor List, will be sent at your request. Write today.

HANDY & HARMAN

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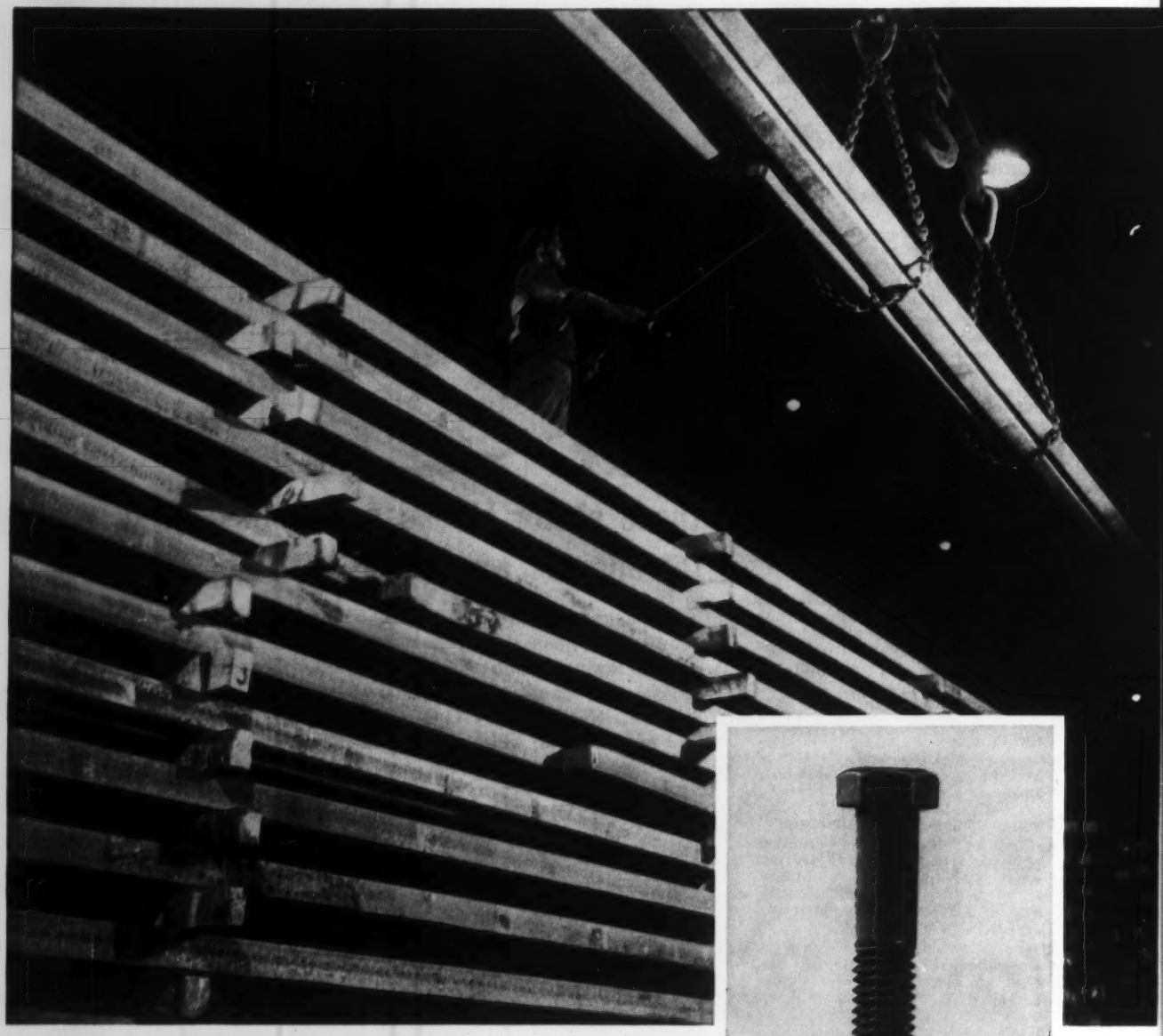

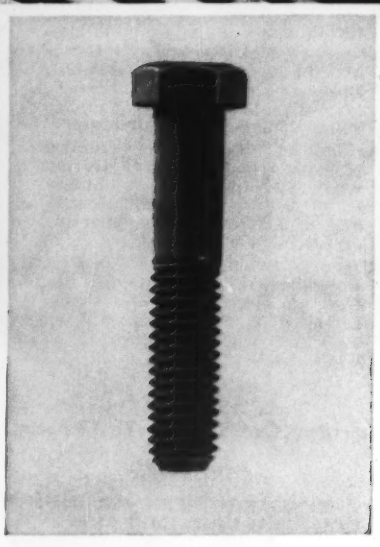

UNIFORM QUALITY OF INCOMING MATERIALS to be used in Republic Bolts and Nuts is assured by coordinated production control. From raw ore to finished cold heading wire, Republic can specify *and produce* exact steel analyses as required by each fastener's final use. This quality of material is matched by constant manufacturing vigilance at our Bolt and Chain Division to produce your best fastener buy. Mail coupon today for complete story.

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World's Widest Range of Standard Steels

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How do *you* select fasteners?

They look alike. They're made to standards. You can't inspect each one before you buy. Yet you have to choose wisely, because your sub-assemblies and assembled products, and, in fact your reputation depend on the reliability of the fasteners you use.

There's a way to be sure of the best. Know your manufacturer.

Mine-to-market coordinated production is your key to quality when you specify Republic Bolts and Nuts. Most fastener makers start their processing with steel in the form of coiled rod. But at Republic, this represents a step midway in the process. Our own teams of metallurgists and inspectors are in complete control of all raw materials from ore mine through blast furnace to the steel billets delivered to our Bolt and Chain Division. In fact, we make over 50 different analyses of alloy and carbon steels, each one the finest available for the ultimate use of fasteners it will form.

This painstaking protection of raw material quality is matched by rigid quality control throughout our fastener manufacturing processes. As a result, you receive the very finest headed and threaded products modern materials, methods and technology can produce.

So don't just order fasteners, *select* Republic and be sure of the best. Contact your local Republic representative or distributor today. He can draw on a complete range of 20,000 standard, plus 8,000 special types and sizes to fill your needs. Or mail the coupon for further information.

YOUR PRODUCT QUALITY is protected when you use Republic's Berger Division contract manufacturing facilities. Here you can have sheet metal components or products fabricated to your own standards, by experts using modern methods—and Republic quality sheet steel. Check this means of reducing plant and equipment investment. Mail coupon today.

A TOP-QUALITY CHAIN LINE for production use or product application is available through your Republic Chain Distributor. He carries every type and size of welded and weldless chain, chain slings, attachments and accessories. Each is subject to quality control from raw ore to finished product to provide maximum reliability. Coupon will bring full information.

MATERIALS HANDLING EQUIPMENT QUALITY is also backed by Republic's mine-to-market manufacturing control. As a result, the installation shown not only cut handling costs 25%, but will provide long-term, trouble-free service as well. Republic offers a broad line of materials handling equipment to suit your requirements. For illustrated literature, send coupon.

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"KRANE KAR Unloads freight cars of billets weighing up to 6000 lbs. . . . Stacks them in yard . . . Transports billets to saw shop . . . Loads forgings on trucks for shipment. KRANE KAR is easier to use than our old stationary crane, and saves us time. Now we can make full use of our yard for billet inventory." Ask for Bulletin #79.

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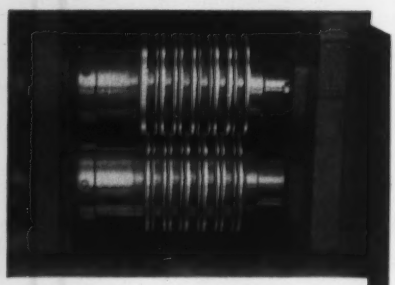

Cowles knives reduce set-up time. They are made so accurately they can be assembled on the arbor without shimming. Cowles knives stay on the job longer;— they reduce down-time for re-grinding; and produce straight edged strip with minimum burr avoiding tie-ups in blanking operations.

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AIME PROGRAM

Temperature Dependence of Annealing Phenomena in a Cold-Rolled Aluminum Single Crystal—A. H. Lutts and P. A. Beck, University of Illinois.

Investigation of the Effect of Solutes on the Grain Boundary Stress Relaxation Phenomenon—S. Weinig, New York University, and E. S. Machlin, Columbia University.

Some Observations on the Structure of Grain Boundary Fracture Surfaces — H. C. Chang and N. J. Grant, Massachusetts Institute of Technology.

Tuesday, Oct. 9, 9 a.m. to 12 noon

Grand Ballroom

SYMPOSIUM ON TITANIUM

Chairmen—B. S. Mesick and D. J. McPherson.
Moderator—R. H. Thielemann.

Panel Discussion: Sponge and Mill Production Economics.

Speaker: H. H. Kellogg, Columbia University.

Panelists: W. E. Lusby Jr., E. I. du Pont de Nemours & Co.
T. W. Lippert, Titanium Metals Corp. of America.
P. Alspaugh, Electro Metallurgical Co.
V. W. Whitmer, Republic Steel Corp.
D. W. Kaufmann, Rem-Cru Titanium Inc.
F. Vandenburgh, Mallory-Sharon Titanium Corp.

Panel Discussion: Fabrication Economics.

Speaker: S. A. Gordon, Battelle Memorial Institute.

Panelists: G. Fairbairn, North American Aviation Inc.
W. H. Sharp, Pratt & Whitney Aircraft Division, United Aircraft Corp.
A. L. Rustay, Wyman-Gordon Co.
R. A. Paetz, Thompson Products Inc.
S. R. Carpenter, Convair Division, General Dynamics Corp.

Tuesday, Oct. 9, 2 to 5 p.m.

Grand Ballroom

SYMPOSIUM ON TITANIUM
(Continued)

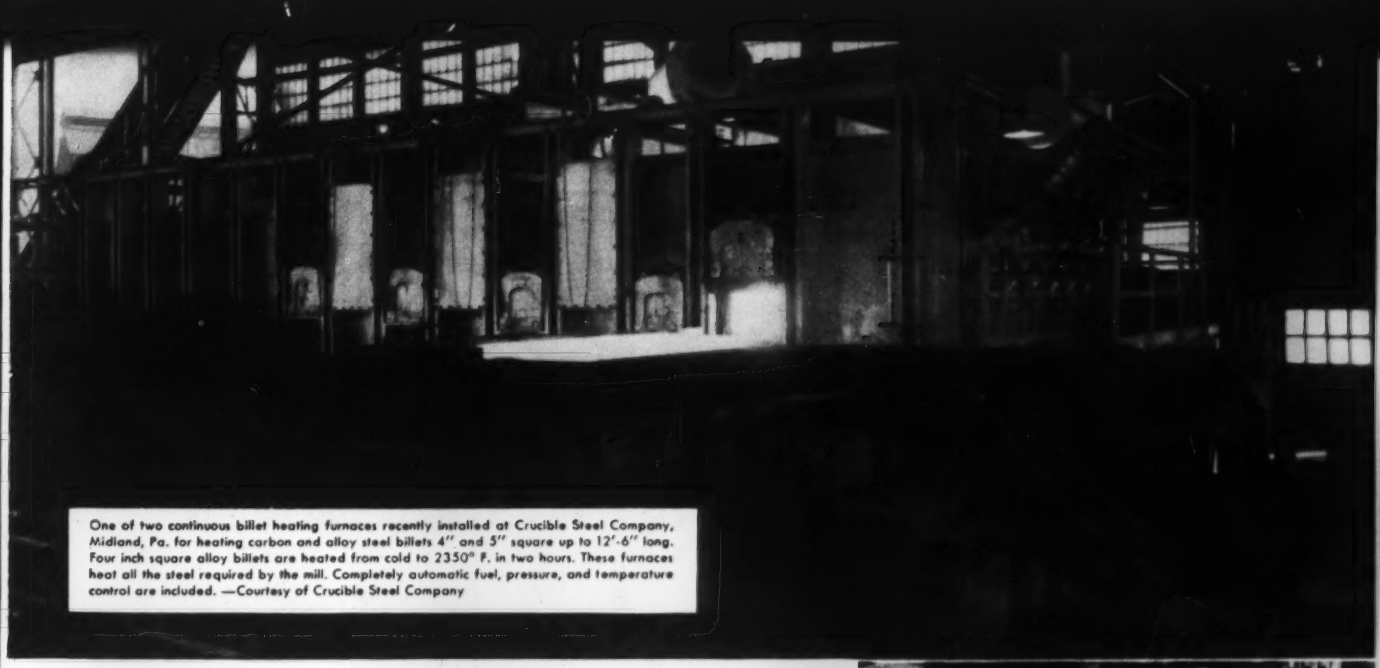
Panel Discussion: State of Analytical Development.

Speaker: S. Vigo, Watertown Arsenal.

Panelists: T. D. McKinley, E. I. du Pont de Nemours & Co.
J. E. Griffin, Mallory-Sharon Titanium Corp.
H. T. Clark Jr., Rem-Cru Titanium Inc.
A. F. Ernster, Ford Motor Co.
W. A. Dupraw, National Research Corp.
M. J. Miles, Titanium Metals Corp. of America.

Panel Discussion: Practical Problems Associated with the Control of Interstitials.

Speakers: L. S. Busch, Mallory-Sharon Titanium Corp.
H. Brown, Solar Aircraft Co.
C. Handova, North American Aviation Inc.



One of two continuous billet heating furnaces recently installed at Crucible Steel Company, Midland, Pa. for heating carbon and alloy steel billets 4" and 5" square up to 12'-6" long. Four inch square alloy billets are heated from cold to 2350° F. in two hours. These furnaces heat all the steel required by the mill. Completely automatic fuel, pressure, and temperature control are included. —Courtesy of Crucible Steel Company

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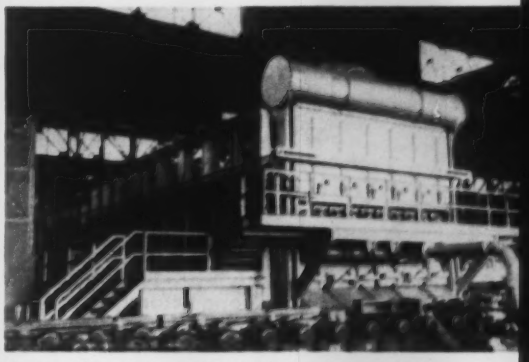
A consultation with Loftus engineers can pay big dividends . . . Call or write—Today!

Oil and gas-fired melting, heating and heat-treating furnaces of every type and description for ferrous and non-ferrous materials producing and processing.

Continuous 75 ton per hour tube reheating furnace installed in one of the largest tube mills in this country. Heats up to 271 pieces per hour of 3½ to 4⅞ inch O. D. pipe up to 65 feet long, to 1850° F. Three zone combustion control heats the tubes uniformly for further processing. Eighteen long flame burners located on each side wall burn coke oven or natural gas.



Continuous 50 metric ton per hour slab heating furnace recently installed in a Japanese steel plant for heating steel slabs 4½" x 24" x 13'-6". Slabs are heated from cold to 2360° F. in 1½ hours. Furnace is equipped with two zone, top and bottom oil-fired burners with screening burners on the discharge end. Two built-in tile recuperator cells of 5000 sq. ft. total heating surface, preheat the combustion air to approximately 725° F. This furnace was designed to achieve highest possible heat recovery, due to excessively high fuel cost in Japan.

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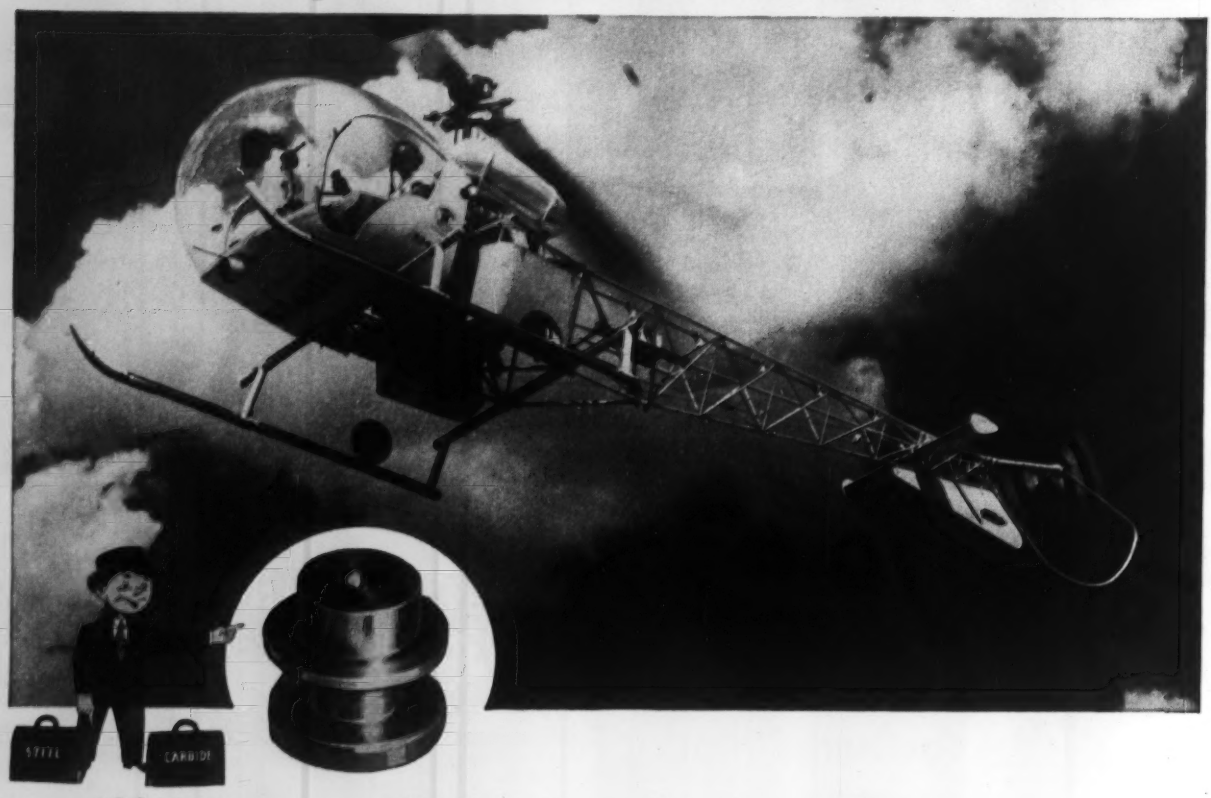


133% more needle bearing pins per grind

Down Fort Worth way at famous Bell Aircraft Corporation, they made production tests on the *new* FIRTHITE TXH Carbide . . . turning and facing needle bearing pins from SAE 4140 steel.

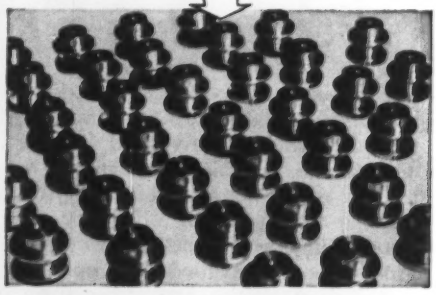
The results speak for themselves:

- 133% more bearing pins per grind.
- More than twice as many pieces per grind as nearest premium grade.
- Seven times more pieces per grind than two other competitive grades.
- Only .007 stock removed to resharpen compared with .025—.035 for competitive grades.

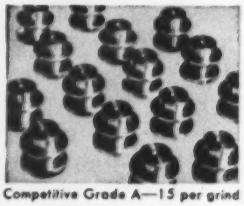
Truly this test proves, as do others all over the country, that FIRTHITE TXH is easily the outstanding carbide in its field . . . a *premium grade* at *no* premium price.

Yes, FIRTHITE TXH is a completely *new* carbide concept . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before!

You, too, can make important savings, and increase production with TXH. It's available *now* in all standard tips and tools. Try it today.



FIRTHITE TXH—35 PER GRIND



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Competitive Grades B & C—4-5 per grind

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AIME PROGRAM

Panelists: H. T. Clark Jr., Rem-Cru Titanium Inc.
T. Perry, Republic Steel Corp.
S. A. Herres, Titanium Metals Corp. of America.
J. A. King, Thompson Products of Canada.

Tuesday, Oct. 9, 2 to 5 p.m.

Petit Cafe

RESEARCH SUMMARIES—ATOM MOVEMENTS and STRUCTURE

Chairmen: F. J. Shortsleeve and D. J. Blickwede.

Basal Plane Development in Electrodeposited Hexagonal Close-Packed Metals—Zinc, Titanium, Zirconium—W. R. Opie, National Lead Co.

Surface Activity Methods for the Determination of Diffusion Coefficients in Solids—R. H. Condit and C. E. Birchenall, James Forrestal Research Center, Princeton University.

X-Ray Diffraction Determination of the Coefficients of Expansion of Alpha - Uranium — J. R. Bridge, C. M. Schwartz and D. A. Vaughan, Battelle Memorial Institute.

Solubility of Boron in Fe3C and Variation of Saturation Magnetization, Curie Temperature and Lattice Parameter of Fe3 (C,B) with Composition—M. E. Nicholson, University of Minnesota.

Crystal Structure of Delta-Prime Plutonium and the Thermal Expansion Characteristics of Delta, Delta-Prime and Epsilon Plutonium — F. H. Ellinger, University of California.

Structure of the Transition Phase, Omega, in Titanium-Chromium Alloy—A. E. Austin and J. R. Doig, Battelle Memorial Institute.

Neutron Diffraction Study of Textures in Drawn Body-Centered Cubic Metals—R. A. Swalin, University of Minnesota, and A. H. Geisler (deceased).

Relative Interfacial Energies of Symmetrical Tilt Grain Boundaries in Silver—K. T. Aust, General Electric Co.

Wednesday, Oct. 10, 9 a.m. to 10:30 a.m.

Grand Ballroom

RESEARCH SUMMARIES—KINETICS and THERMODYNAMICS

Chairmen: C. E. Birchenall and R. A. Swalin.

Structure Dependent Corrosion of Cu3Au—Experiments Relating to the Mechanism of Stress Cracking of Homogeneous Solid Solutions—Robert Bakish, Sprague Electric Co., and W. D. Robertson, Yale University.

Growth of External Copper Layers During the Internal Oxidation of Dilute Cu-Al Alloys in a Cuprous Oxide-Copper Pack—D. L. Wood, General Electric Co.

Free Energy of Formation of Mn7C3 From Vapor-Pressure Measurements—C. L. McCabe and R. G. Hudson, Carnegie Institute of Technology.

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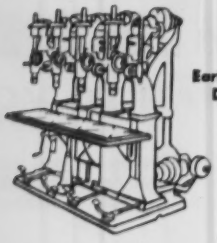
1872 - 1956

FROM

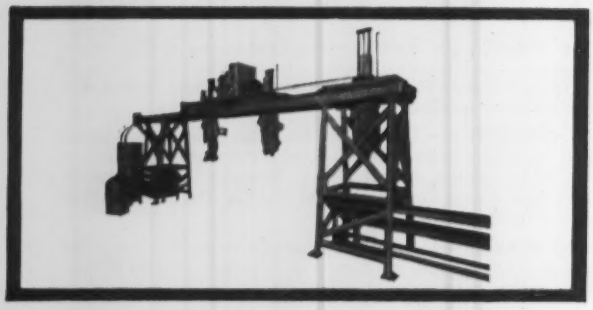
Foot Powered Scroll Saw

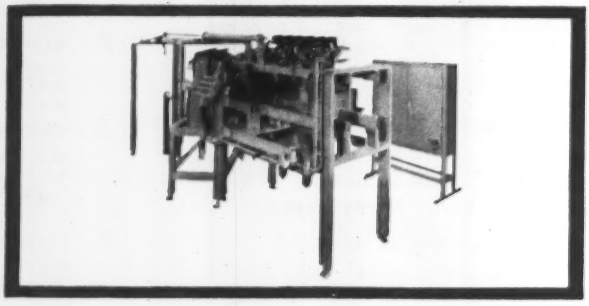


Early Gang Driller

● It was back in 1872 when the ox cart was still used for transporting goods and Edison was still experimenting with the electric light, that W. F. & John Barnes built their first industrial machine — a Foot Powered Scroll Saw. Later in the 1880's, the first Gang Drilling Machine was designed and built. This forerunner of the modern machine tools of today was shipped by ox team to a customer in a nearby town. Three days later, the records say, it arrived at its destination — a distance of 40 miles.

It is also a matter of record that all through these years, from oxen to jets, machines bearing the W. F. & John Barnes' name have been consistently associated with progressive developments and improvements in manufacturing methods. As a result, when you specify a Barnes' built machine today, you get a creative engineering and building service that is seasoned by experience — one that is complete and geared to serve your needs better than ever before.





A SPECIAL CONVEYORS — typical of variety of units designed and built from standard components to increase material handling efficiency between machining operations. Engineered to meet individual job requirements.

A SPECIAL AUTOMATION EQUIPMENT—includes a range of turn mechanisms, (illustrated), special transfer and unloading equipment, inspection, and assembly machines, designed for automatic or semi-automatic production-line operations.

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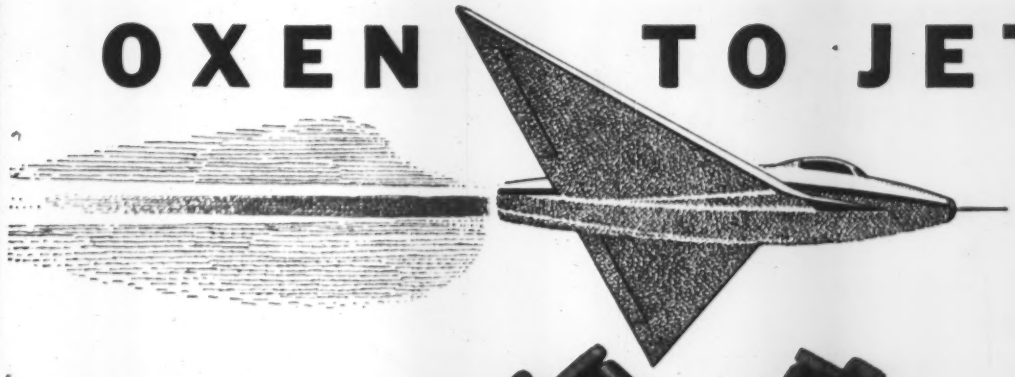
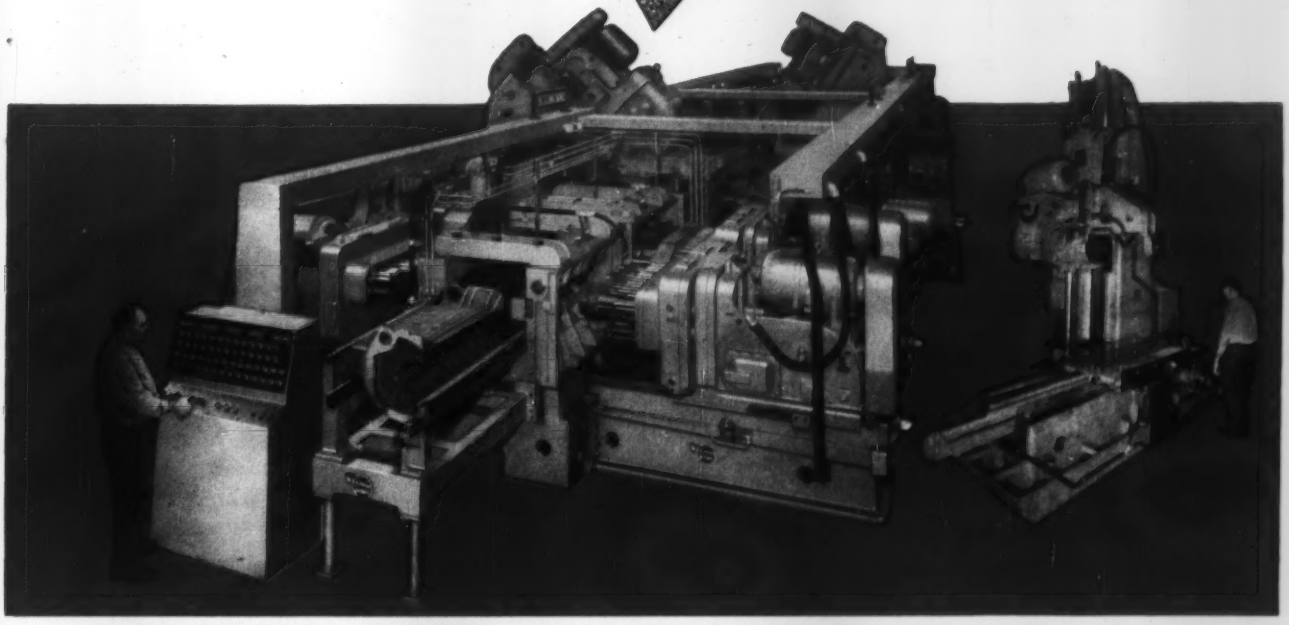
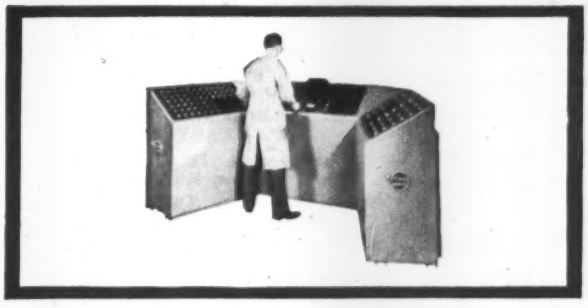
OXEN TO JETS





MODERN MACHINE TOOLS — units illustrated are typical of the large Progress-Thru and Single Station units designed and built by Barnes. 11-Station unit at left was designed to machine both 4 and 6-cylinder tractor engine blocks at 25 pieces per hour. Single-spindle machine at right slab and face mills motor frame mounting pads at 6½ pieces per hour.



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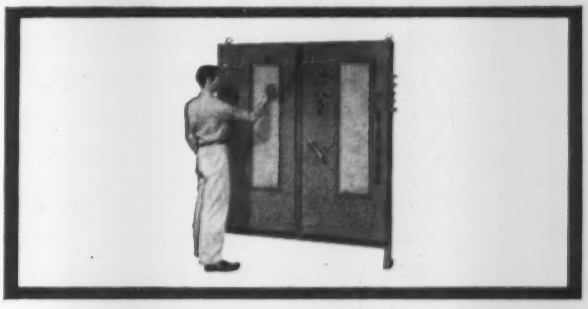

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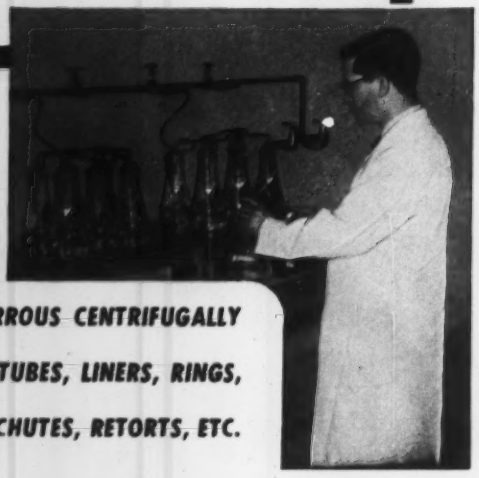

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FERROUS AND NON-FERROUS

SANDUSKY FOUNDRY AND MACHINE CO., Sandusky, Ohio

AIME PROGRAM

Oxygen in Liquid Iron-Nickel Alloys—H. A. Wriedt, U. S. Steel Corp., and John Chipman, Massachusetts Institute of Technology.

Wednesday, Oct. 10, 9 to 10:30 a.m.

Petit Cafe

RESEARCH SUMMARIES—TRANSFORMATION

Chairmen: J. S. Smart Jr. and R. F. Hehemann.

Study of the Iron-Silicon Order-Disorder Transformation—F. W. Glaser, Alloy Precision Castings Co., and W. Ivanick, Schwarzkopf Development Corp.

Structural Changes During Aging in an Aluminum-Magnesium-Zinc Alloy—L. F. Mondolfo, Illinois Institute of Technology; N. A. Gjostein, Carnegie Institute of Technology; and D. W. Levinson, Armour Research Foundation.

Sympathetic Nucleation of Ferrite—H. I. Aaronson and C. Wells, Carnegie Institute of Technology.

Electrical Resistivities and Phase Transformations of Lanthanum, Cerium, Praseodymium, and Neodymium—F. H. Spedding, A. H. Daane and K. W. Herrmann, Iowa State College.

Wednesday, Oct. 10, 2 to 5 p.m.

Grand Ballroom

SYMPOSIUM ON MAGNETISM

Chairmen—J. C. Fisher and Morris Fine.

Fundamentals of Magnetism—J. B. Goodenough, Massachusetts Institute of Technology.

Kinetics of Magnetization—D. S. Rodbell, General Electric Co.

Metallurgy of Magnetic Materials—J. J. Becker, General Electric Co.

Wednesday, Oct. 10, 2 to 5 p.m.

Petit Cafe

RESEARCH SUMMARIES—ALLOY SYSTEMS

Chairmen: A. D. Schwope and William Rostoker.

Study of Ferrous Ternary Diagrams in Relation to Magnetic Interactions: The FeNiAl System—U. H. Roesler, Westinghouse Research Laboratories.

Melting Point Determination of Hafnium, Zirconium and Titanium—D. K. Deardorff and E. T. Hayes, U. S. Bureau of Mines.

Gamma Loop Studies in the Iron-Silicon and Iron-Silicon-Titanium Systems—G. G. Bentle and W. P. Fishel, Vanderbilt University.

Uranium-Bismuth System—R. J. Teitel, Brookhaven National Laboratory.

Uranium-Silicon Alloys—A. E. Kaufmann, Nuclear Metals Inc.; B. D. Cullity, University of Notre Dame; and G. Bitsianes, University of Minnesota.

Uranium-Zinc System—P. Chiotti, H. H. Klepfer and K. J. Gill, Iowa State College.

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OIDDINGS & LEWIS MACHINE TOOL COMPANY

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From its Wide Variety of Qualities and Sizes

SANDVIK CAN PINPOINT THE SPRING STEEL ...that fits your purpose

Sandvik has both the specialized experience and the special-purpose strip steels to solve almost any spring steel problem.

You can call on Sandvik's knowledge of special spring steel applications for assistance in determining the type of steel required. Then, from its extensive range of qualities, finishes and sizes, Sandvik can usually pinpoint a steel that's practically "custom-tailored" for you.

For applications which require special physical properties, high fatigue life, fine surface finish, accurate and uniform gauge, check with Sandvik.

You can get Sandvik cold rolled specialty strip steels:

- **In special analyses for specific applications.**
- **Precision-rolled in thicknesses to fit your requirements.**
- **In straight carbon and alloy grades.**
- **Annealed, unannealed or hardened and tempered.**
- **Polished bright, yellow or blue.**
- **With square, round or dressed edges.**
- **Wide range of sizes in stock—or slit to your specifications.**

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Write for this Free, complete Sandvik catalog.

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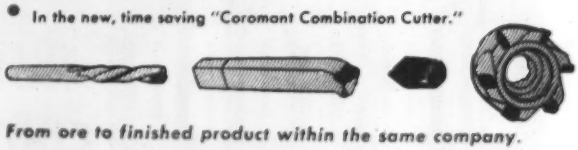
Sandvik Quality Steels

SS-111

SANDVIK *Coromant* CARBIDE TIPPED TOOLS AND BLANKS

- **In a wide variety of tools and blanks from stock — including many shapes and designs which have been considered "specials" before.**
- **In all standard grades with improved performance to suit a wide range of applications.**
- **Grades permanently color-identified on the end of tool shank and etched in the carbide blanks.**
- **In the new, time saving "Coromant Combination Cutter."**



From ore to finished product within the same company.

AIME PROGRAM

Constitution of Nickel-Rich Quaternary Alloys of the Nickel-Chromium-Titanium-Aluminum System—A. Taylor, Westinghouse Research Laboratories.

Solid Solubility of Carbon in Chromium—W. H. Smith, General Electric Co.

SNT — Society for Nondestructive Testing

Hamilton Migel
President

Monday, Oct. 8—9 a.m.

Hollenden Hotel

General program chairman—R. F. Holste, vice president, Society for Nondestructive Testing.

EDUCATIONAL SESSIONS

Chairman—D. T. O'Connor, Machlett Laboratories Inc.

Co-Chairman—Frank Catlin, Magnaflux Corp.

Welcome—Hamilton Migel, president, SNT.

Orientation—D. T. O'Connor, chairman, SNT Educational Committee.

Sources of Defects Located by Nondestructive Testing—Carl E. Betz, Magnaflux Corp.

Radiography—W. D. Kiehle, Eastman Kodak Co.

Radiographic Film Interpretation—L. L. Johnson, Pratt & Whitney Aircraft.

Fluoroscopy—W. R. Hampe, Westinghouse Electric Corp.

Penetrant Testing—Taber DeForest, Magnaflux Corp.

Eddy Current Testing—G. O. McClurg, Magnaflux Corp.

1:45 p.m.

EDUCATIONAL SESSIONS

Magnetic Particle Inspection—W. E. Thomas, Magnaflux Corp.

Ultrasonic Testing, Contact Methods—Ralph W. Frank, Sperry Products Inc.

Ultrasonic Testing, Immersed Methods—J. B. Morgan, Aluminum Co. of America.

Ultrasonic Testing, Resonance Methods—P. K. Block, Branson Instrument Co.

Question Period

There may be some risk in showing how Kinnear Rolling Doors solve so many *special* problems, in doorways like the one above.

It might give the impression Kinnear Doors aren't best for *ordinary* needs — which they are.

But in the picture above, note how the traveling crane moves right up to the face of the door. Notice the windows close to the door on either side. Also the steel supports and piping above the doorway. And the way floor and wall space is used clear up to the door jambs.

The Kinnear Rolling Door never gets in their way, and they never impede the door's action.

Because of Kinnear's *coiling upward action*, the whole curtain of interlocking slats coils into a small space above the opening. No usable room is wasted anywhere.

Kinnear *originated* this type of door, more than 50 years ago. It has been industry's first choice ever since.

The rugged all-steel curtain gives extra protection against weather, theft, vandalism and fire. It takes extra years of hard, daily use with minimum maintenance. Accidentally damaged slats can be individually replaced. Heavily galvanized (*1.25 oz. of pure zinc per sq. ft., ASTM standards*) it stands up longer, through toughest weather and climate. Its straight-line design harmonizes with any architectural style or building material.

Kinnear Rolling Doors are built any size, for motor or manual control. Write for full details, or recommendations to fit your needs.

KINNEAR ROLLING DOORS
Saving Ways in Doorways

The KINNEAR MFG. Co.

FACTORIES:
1780-1800 Fields Avenue, Columbus 16, Ohio
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Offices and Agents in All Principal Cities

You can make it better

WORLD'S TALLEST MAN-MADE STRUCTURE. 100 ft. higher than the antenna atop the Empire State Building, the 1572 ft. television tower of Station KWTA in Oklahoma City dramatically illustrates the advantages obtainable with USS MAN-TEN Steel in structures where both great strength and light weight are imperative.

USS MAN-TEN Steel supplies the needed strength in the intermediate sections of the tower, 1050 ft. in all, where maximum diameter mild rolled steel rounds were simply not strong enough to carry the load of the tower above.

In the topmost bays, mild steel although strong enough was replaced by lighter, smaller sections of USS MAN-TEN Steel to provide greater or equal strength while at the same time reducing wind resistance so that the structure will be safe in winds up to 150 mph.

RUGGED IS THE WORD. Used in the body liner plates and canopy guard of this 34-ton Rear Dump built by Euclid Division, General Motors Corporation, Cleveland, O., USS TRI-TEN Steel provides 50% greater strength, 60% greater toughness and three times the resistance to atmospheric corrosion of structural carbon steel. And what is of particular importance in equipment like this, that must be able to operate all year around, is TRI-TEN Steel's ability to withstand the shock and impact of heavy, high speed loading even at sub-zero temperatures.

with USS High Strength Steels

In USS High Strength Steels, design engineers have at their command three service-tested steels that will permit them to materially increase the efficiency and economy of machinery, equipment and structures at little or no increase in first cost . . . and frequently, at a saving.

All three of these famous *"steels that do more"*—USS Cor-Ten, USS Man-Ten and USS Tri-Ten—have a 50% higher yield point than ordinary carbon steel. All have better corrosion resistance and offer greater resistance to wear, fatigue and impact. Each, however, has specific superior properties that should be considered in determining its selection.

USS Cor-Ten Steel, for example, is distinguished by its superior resistance to atmospheric corrosion—4 to 6 times that of carbon steel. USS Man-Ten Steel is intended for weight reduction by means of greater strength in moderate forming applications, with enhanced resistance to abrasion and atmospheric corrosion. USS Tri-Ten Steel's outstanding characteristics are excellent weldability and resistance to shock at low temperatures.

Used singly or in combination, these steels can advantageously replace carbon steel to increase the strength and durability of vital parts *without* increasing their weight. Or when the use of thinner sections is feasible, they can (1) reduce equipment weight without reducing its strength, or (2) increase the size and capacity of equipment without increasing total weight or the power required to move it.

• • •

You will find our 174-page *"Design Manual for High Strength Steels"* extremely useful in applying the benefits of these steels to your product. Send for free copy—simply write on your company letterhead to United States Steel Corporation, Room 5320, 525 William Penn Place, Pittsburgh 30, Pa.

HARD-WORKING FARM EQUIPMENT lasts longer, is more dependable when built with USS Cor-Ten Steel. Here used in the main axle and tractor hitch frame of the famous John Deere No. 12-A Combine, USS Cor-Ten Steel gives these vital parts maximum strength, maximum toughness with no increase in weight and at the same time ensures high fatigue resistance—50% greater than that of plain carbon steel. Racking and twisting strains that could easily cause a breakdown are safely absorbed by Cor-Ten Steel's high endurance limit—and the equipment stays on the job.

STRENGTH AND TOUGHNESS are prime requisites in boom boats like this. Used by logging firms to buck logs in the sawmill pond to the log haul-up, these busy little vessels receive very rough treatment, are frequently squashed between the huge logs they handle. To ensure all the strength possible in the hull, sides and bottom are plated with Cor-Ten Steel, welded both inside and out. Cor-Ten Steel's greater abrasion resistance and its high resistance to corrosion also play an important part in prolonging life. (Built by the Ilwaco Boat Works, Ilwaco, Wash.)

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
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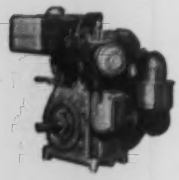
USS HIGH STRENGTH STEELS

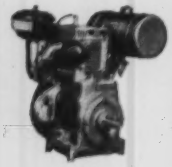
USS MAN-TEN • USS COR-TEN • USS TRI-TEN

UNITED STATES STEEL

POWER to Match Your Equipment

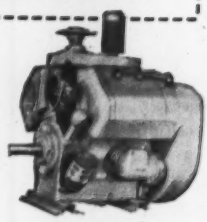


4-cycle single cyl., 3 to 6.8 hp.



Single cyl., 6 to 9 hp.

2-cyl., 7 to 15 hp.



V-type 4-cyl., 15 to 36 hp.

WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES

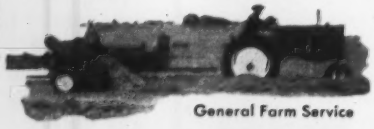
When we say: "Power to Match Your Equipment"... our thinking goes far beyond *Basic Design to Fit the Machine* and *Performance Dependability to Fit the Job*, although these are vital considerations. Of equal and possibly even greater importance is the inherent structural ability of all Wisconsin Heavy-Duty Air-Cooled Engines to match your equipment in terms of long-life serviceability.

Actually, the Wisconsin power unit frequently *outlasts* the equipment of which the engine is an integral part . . . in terms of not just *hundreds* but *thousands* of hours of on-the-job service under the most gruelling field conditions. Building engines of this calibre calls for intensive, specialized experience.

Here at Wisconsin we build *only* HEAVY-DUTY AIR-COOLED INDUSTRIAL ENGINES. There is nothing to divert our engineering skill, experience and production know-how from this *one purpose*—to design and manufacture rugged, high torque engines that measure up to the power demands of the equipment they operate. Many, many Wisconsin Engines are still in prime operating condition long after the equipment they power has outlived its usefulness.

Horsepower for horsepower, there are no more rugged engines built than "WISCONSIN"... and every Wisconsin Engine is backed by more than 2,000 Authorized Service Stations in the United States and Canada and in 82 foreign countries. In addition, the line offers complete power selectivity in a 3 to 36 hp. range . . . in 4-cycle single-cylinder, 2- and 4-cylinder models, designed to operate on gasoline, kerosene, natural gas and LP fuels.

Let Wisconsin engineering and proved acceptance work *with* and *for* you and your customers.



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World's Largest Builders of Heavy-Duty Air-Cooled Engines

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SNT PROGRAM

Tuesday, Oct. 9—9 a.m.

DEVELOPMENTS IN NONDESTRUCTIVE TESTING METHODS

Chairman—M. Grossman, Sylvania Electric Products Inc.

Co-Chairman—Prof. R. B. MacCauley, Ohio State University.

Standardization and Applications of Ultrasonic Surface Wave Inspection—G. J. Binczewski, Kaiser Aluminum & Chemical Corp.

Data Extraction in Nondestructive Testing—H. N. Staats, Applied Research Inc.

Inspection of Small Diameter Tubing by Eddy Current Methods—John W. Allen and Robert B. Oliver, Oak Ridge National Laboratory.

Broad Beam Attenuation Data for Concrete for 70-250 K.V.P. X-Rays—E. Dale Trout, General Electric Co.

Design and Application of a Portable X-Ray Spectrograph—Irwin I. Bessen, North American Philips Co. Inc.

1:30 p.m.

NONDESTRUCTIVE TESTING IN THE PETROLEUM and CHEMICAL INDUSTRIES

Chairman—A. Barkow, Natural Gas Pipeline Co. of America.

Co-Chairman—F. Hohn, Scullin Steel Co.

Quality Characteristics of Chemical Equipment and Their Control Through Nondestructive Testing—C. J. Veith, E. I. du Pont de Nemours & Co.

Inspection of Piping—H. Thielsch, Grinnel Co. Inc.

Ultrasonic Inspection in the Oil Refining and Related Industries—D. J. Evans, Engineering Test Services Inc.

A Fast, Economical Inspection for Drill Pipe—F. M. Wood, Tuboscope Co.

6:30 p.m.

Hospitality hour, banquet and presentation of SNT awards.

Wednesday, Oct. 10—9 a.m.

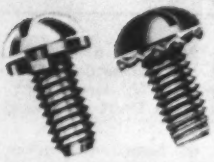
NONDESTRUCTIVE TESTING OF NUCLEAR REACTOR COMPONENTS

Chairman—W. McGonnagle, Argonne National Laboratory.

Co-Chairman—D. C. Worlton, General Electric Co.

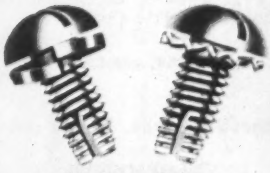
Nondestructive Testing Problems in the Nuclear Reactor Field—S. McLain and W. J. McGonnagle, Argonne National Laboratory, and E. C. Wood, General Electric Co.

Basic Principles and Techniques of Eddy Current Testing—H. L. Libby, General Electric Co.



SPRINGTITES AND SEMS

SNAP RINGS

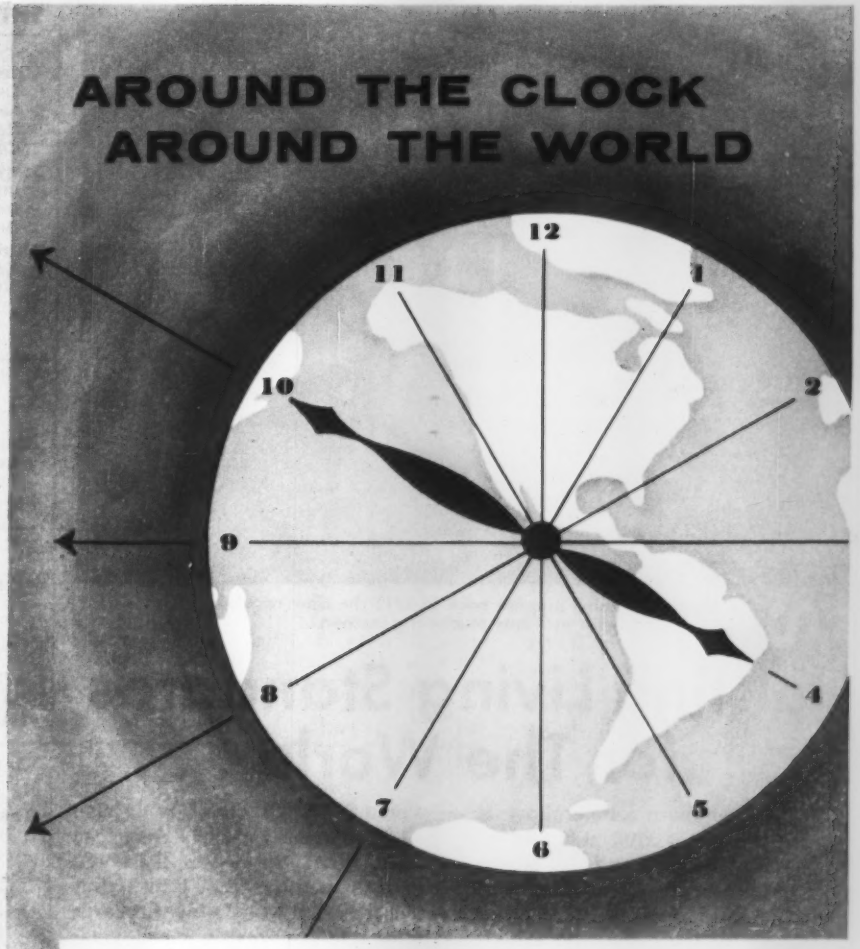


THREAD-CUTTING SPRINGTITES AND SEMS

EATON KEPS®

HOZ-FAS-NERS®

SPRING LOCK WASHERS



Eaton-Reliance Fasteners Keep Assemblies Tighter Longer

Used to advantage wherever assemblies are fastened together, Eaton-Reliance products will be found throughout industry . . . railroad, automotive, appliance, electric, heavy and light machinery, aircraft, and many others. They are manufactured of quality controlled materials to rigid specifications, and are designed to reduce assembly costs and speed up production. There's an Eaton type fastener for your particular needs. Send for free Engineering Bulletin giving details. Just name the fasteners in which you are interested.

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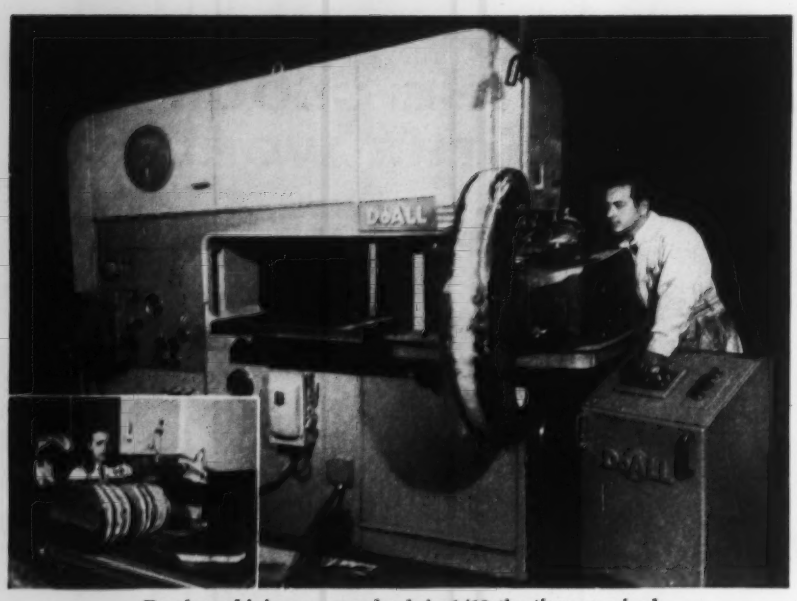

Band machining a crane hook in 1/12 the time required with previous machining methods.

Hoisting Living Standards for The World . . .

The man at the machine above is earning himself a high standard of living with a modern tool. He is also participating in the improvement of living standards for people of other countries. The huge crane hook he is shaping out on a DoALL Band Machine will help fill the holds of merchant ships with "tools" to increase human productivity wherever they are used. The tools of production we ship abroad can create prosperity . . . and peace . . . in the world.

The role that tools play in raising standards is well exemplified in the $10,000 DoALL machine pictured. It cuts the slots in the forged steel crane hook in 3 hours, consumes $10 worth of saw bands for the job. The machine previously used cost $25,000, took 36 hours to do the job and consumed $200 worth of cutting tools.

Whenever industry employs newer, better tools, like the DoALL, the tool operators produce more in less time at lower cost. A greater abundance of goods is then made available at a price people can pay. Everybody benefits.

About $12,500 worth of production "tools" are in use for every American worker. When the rest of the countries of the world employ tools to this extent they will have living standards comparable to ours. Then their people won't want wars any more than we do.

When we ship "tools" of production, we ship better living standards and the hope for permanent peace.

Reprints available for your employees.

The DoALL Company

Des Plaines, Illinois
38 Local Sales-Service Stores E-12

FREE EDUCATIONAL WALL CHART shows the seven trade regions of the world possessing natural resources sufficient for them to attain American living standards . . . provided they employ tools as widely as we do. Address requests to:

SNT PROGRAM

Ultrasonic Methods and Techniques Used at the Savannah River Laboratory—R. W. Leep and J. D. Ross, E. I. du Pont de Nemours & Co.

Inspection of Small Diameter Tubing for Nuclear Reactor Applications—R. B. Oliver, Oak Ridge National Laboratory.

Ultrasonic Scanning and Recording Equipment—W. N. Beck, Argonne National Laboratory.

MEHL HONOR LECTURE

1:30 p.m.

Standards for Nondestructive Testing Practices—N. L. Mochel, Westinghouse Electric Corp.

ANNUAL MEETING

Thursday, Oct. 11—9 a.m.

DEVELOPMENTS IN NONDESTRUCTIVE TESTING METHODS

Chairman — B. Havercroft, Physical Metallurgical Division, Mines Branch, Ottawa, Ont.

Co-Chairman—B. Cantor, Washington.

The Ultrasonic Micrometer—A New Nondestructive Test Tool—H. A. Rocha, General Electric Co.

Production Inspection of Pipe and Tubing by the Immersed Ultrasound Method—Robert B. Oliver, R. W. McClung and J. K. White, Oak Ridge National Laboratory.

Field Performance of TVX System—J. E. Jacobs and A. L. Pace, General Electric Co.

Fluoroscopy with Electronic Image Intensification—A. L. Gobus, North American Philips Co.

1:30 p.m.

NONDESTRUCTIVE TESTING OF AIRCRAFT

Chairman—Mrs. R. H. Sparling, Convair, a division of General Dynamics Corp..

Co-Chairman—L. L. Johnson, Pratt & Whitney Aircraft.

Relationship Between Defect Orientation and Ultrasonic Indications—R. E. Kleint, North American Aviation Inc.

Classification of Contractors' Standards for the Procurement of Bureau of Aeronautics' Magnesium and Aluminum Castings—E. L. Criscuolo and N. Modine, U. S. Naval Ordnance Laboratory.

Radiography in Production Control and Inspection of Reliable Subminiature Tubes—E. A. Kolm, Raytheon Mfg. Co.

X-Ray of Airframe Components at the Aircraft for Maintenance Purposes—F. R. Richardson, U. S. Air Force.

YOUR GUIDE TO COLUMBIA HIGH SPEED TOOL STEEL GRADES

TYPE AND GRADES	DESCRIPTION	HARDENING RANGE	QUENCH	TEMPERING RANGE	USEFUL HARDNESS
T1 — CLARITE	Standard type, high red hardness, good strength, wide range of use with high over-all efficiency	2000° F. to 2350° F.	Oil or Salt Bath	1000° F. to 1250° F.	65/60 Rc
T2 — VANITE	Increased carbon and vanadium; best for form tools and finishing cuts	2300° F. to 2375° F.	Oil or Salt Bath	1000° F. to 1050° F.	66/63 Rc
T4 — ACMITE	18-4-1 high speed steel with 5.00% cobalt added; for heavy cuts, all around high speed cutting with long life at high speeds.	2325° F. to 2375° F.	Oil or Salt Bath	1000° F. to 1025° F.	66/64 Rc
T5 — COBITE	18-4-2 with 8.00% cobalt high speed steel, extreme red hardness, for hogging cuts on scaly and hard abrasive materials	2325° F. to 2375° F.	Oil or Salt Bath	1000° F. to 1100° F.	66/64 Rc
T8 — MAXITE	High carbon, high vanadium with 5.00% cobalt. High production steel for cutting hard castings and tough heat treated alloy steels	2325° F. to 2375° F.	Oil or Salt Bath	1025° F. to 1075° F.	66/63 Rc
M2 — MOLITE SMOOTHCUT	Molybdenum-tungsten multipurpose high speed steel with smoothcutting additives for greatest economy	2100° F. to 2275° F.	Oil or Salt Bath	1000° F. to 1250° F.	66/58 Rc
M3 — MOLITE 3	Molybdenum-tungsten high speed steel with higher carbon and vanadium for fine cuts including broaching and reaming	2175° F. to 2250° F.	Oil or Salt Bath	1000° F. to 1100° F.	66/63 Rc

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES:

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Detroit 3, 121 Oakman Blvd., Phone TUlsa 3-3770
Los Angeles 22, 6955 E. Bandini Blvd., Phone RAymond 3-4684
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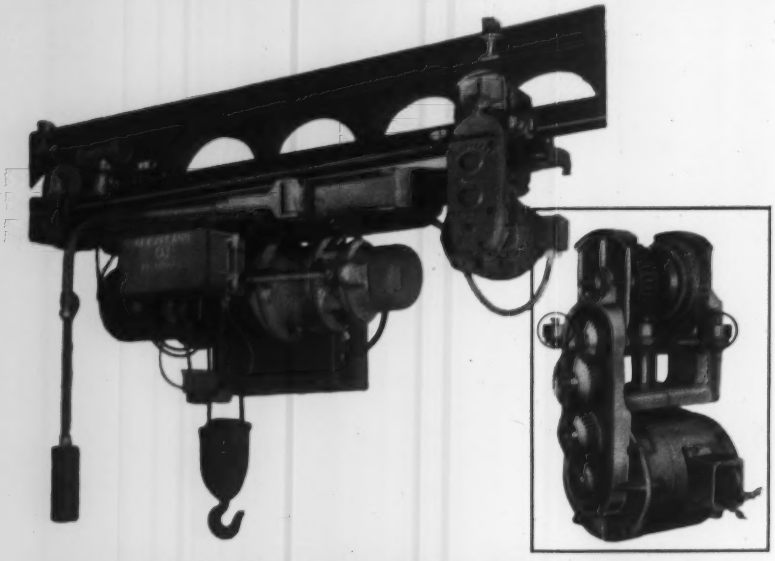
1957

TOOL COLUMBIA STEELS

COLUMBIA TOOL STEELS

DIE STEELS: Superdie — Atmodie — E-Z-Die Smoothcut — Exl-Die — CEC Smoothcut HOT WORK STEELS: Clarite HW — Formite #3 — Formite #2 — Molite HW10 — Vanadium Firedie — Alcodie — Firedie CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra — Columbia Extra Headerdie — Vanadium Standard — Columbia Standard

BEARING TIPS by McGill



CLEVELAND TRAMRAIL GUIDES MOTOR HEADS ON McGILL CAMROL BEARINGS

Motor-driven electric hoist carriers made by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Company, incorporate McGill CAMROL Cam Follower bearings as side guide rollers for the motor head.

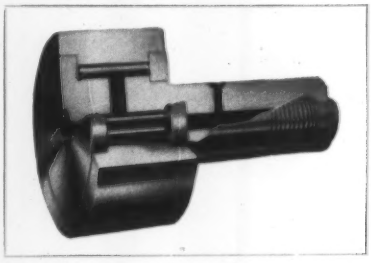
The CF bearings keep the motor head square on the monorail track used in this system and guide the head around curves. Moving on the rails at speeds up to 250 feet per minute, the bearings take the thrust load when entering into a curve.

Replacing spring loaded friction type bolt and roller units, the simplicity of mounting and the friction-free operation of the CAMROL cam followers provide dependable, trouble-free operation of the carrier assembly. Used almost six years, bearing performance has been most satisfactory.

Fact-packed Bearing Catalog

Write for your copy of Catalog No. 52, a revised 140-page Bearing Selection Guide. It contains vital product information and 30 pages of engineering data.

CAMROL BEARINGS DIRECT ACCURATE CAM ACTION



Precision built throughout, CAMROL CF Bearings are designed to add the advantages of smooth accurate cam action to rugged shock-absorbing dependability in any type cam follower application. An interchangeable sealed SCF series protects critical installations.

Lodge and Shipley Lathes Support 18′ Propellors on Camrol CYR Bearings

Eighteen foot propeller shafts and other large work are supported and guided accurately on Lodge and Shipley Lathes through use of Camrol CYR Bearings. The Lodge and Shipley Company has standardized on these heavy duty Cam Yoke Roller Bearings for the Roller Jaw Steady Rest on their larger Engine Lathes. Four CYR bearings are mounted in a yoke at the ends of adjustable slides to provide dependable, precision support for a variety of work.

CAMROL CYR Series Adapts To Yoke Mounting

Internal construction of the CYR Series bearing is similar to that of a CF Series bearing with a heavy outer ring selection to withstand shock load. However, the stud is replaced by an inner ring for receiving shaft in a yoke mounting.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL®
Full Type Roller Bearings

McGILL MANUFACTURING COMPANY, INC., 301 N. LAFAYETTE ST., VALPARAISO, INDIANA

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President

Statler Hotel

Tuesday, Oct. 9—9:30 a.m.

FURNACE ATMOSPHERES—THEIR SELECTION and APPLICATION

Review of Atmospheres—Their Types—Curtis H. Vaughan, Electric Furnace Co.

Review of Atmospheres—Their Applications—Clarence E. Peck, Westinghouse Electric Corp.

FURNACE ATMOSPHERES—THEIR CONTROL

Types of Controllers Available—Wayne Besselman, Leeds & Northrup Co.

Methods of Controlling Atmosphere Converters—Walter Holcroft, Holcroft & Co.

Methods of Controlling Atmosphere in Furnaces—Orville Cullen, Surface Combustion Corp.

Atmosphere Furnaces—Their Safe Operation—Norman H. Davies, North American Mfg. Co.

Special Libraries Association Metals Division

Meetings at Public Auditorium
Club Room C
Headquarters: Hotel Manger

Wednesday, Oct. 10

10:30 a.m. to 12:30 p.m.

Cuyahoga river valley industrial cruise.

2 p.m. to 4:30 p.m.

Field trip to National Carbon Co. research laboratories and library.

7 p.m. to 9:30 p.m.

Field trip to Ford Motor Co.'s Cleveland foundry and engine plant No. 2 automated assembly lines.

Public Auditorium

Thursday, Oct. 11—10 a.m.

Automation in Literature Research—A report on the ASM Mechanized Literature Searching Project—Allen Kent, Western Reserve University.

2 p.m.

Publications on industrial uses of atomic energy. (Best sources of information and organization and use of the library.)

The Literature of Industrial Power Uses of Atomic Energy—Fred E. Croxton and Philip Leslie, Goodyear Atomic Corp.

The Literature of Radiation Effects on Materials—James B. Dodd, Babcock & Wilcox Co.

The Literature of Radioactive Testing Techniques.
(Speaker to be announced.)

6:30 p.m.

Dinner and social hour, Hotel Manger, Dr. Lillian Gilbreth, guest speaker.

Friday, Oct. 12

9 a.m. to 10:30 a.m.

Field trip to The Penton Publishing Co. (Publishers' problems in metals research.)

11 a.m. to 12:30 p.m.

Tour of Port of Cleveland, U. S. Customs facilities.

Die Wear Forum

Public Auditorium, Lakeside entrance

Thursday, Oct. 11, 9:30 a.m.

Chairman: Paul G. Nelson, Budd Co. Roundtable discussions on die wear and die life. Limited to 200; luncheon included.

Good welders know a soft, quiet arc means that all the electrical energy is being spent pushing metal into a strong, sound seam. They know there will be less spatter loss, less cleaning time, lower welding cost per foot.

It is this quality of soft arc that distinguishes the Westinghouse XL-610 electrode. With it, welders get the kind of welds their *pride in workmanship* demands... production managers get the sound physicals and low cost their *product* demands.

If you haven't yet tried the Westinghouse XL-610—the soft-arc, easy-handling AWS E-6010 electrode—why don't you do so now. Fill in the attached coupon and mail it to us today. J-21952

Only Westinghouse offers this welding leadership!

YOU CAN BE SURE...IF IT'S
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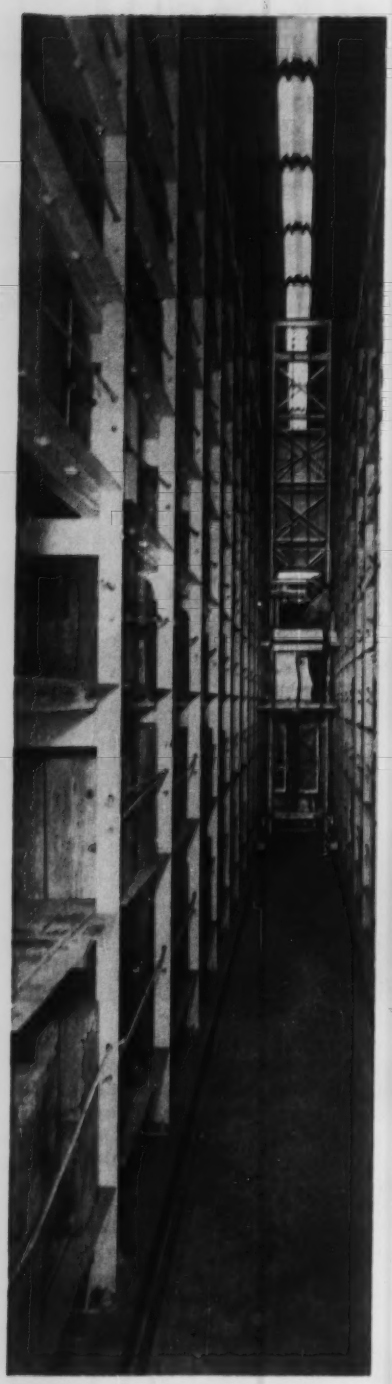
WESTINGHOUSE ELECTRIC CORPORATION
Welding Dept., P. O. Box 868
Pittsburgh 30, Pennsylvania

☐ Send full information, samples, Westinghouse FP2-612 Electrodes
☐ Have welding specialist call

Name _____ Title _____
Company _____
Street & No. _____
City _____ Zone _____ State _____

A 3000 lb. die handled like a feather with these special Economy die-handling Lifters



Push-button control for elevating the platform, propelling the machine down the narrow aisles, and moving the dies in and out of the racks, gives finger-tip high speed handling. The storage capacity is multiplied ten times the floor area and with every die located for immediate selection.

This die handling system, Economy engineered and built, is an example of how materials handling problems can be solved by Economy engineers who have specialized in custom-built machines for over 50 years.

Our representatives, trained in engineering, are located in all principal cities. Why not call one in on your material handling or overhead servicing problem?

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NEW YORK OFFICE

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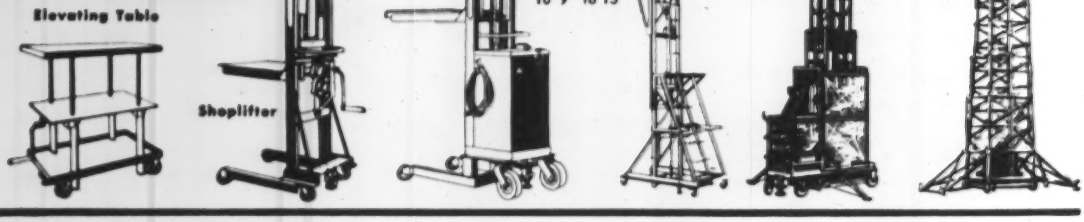
Economy also make a complete line of standard lifters



38 NATIONAL METAL CONGRESS & EXPOSITION

EXHIBITORS

Cleveland's Public Auditorium and Exhibition Halls will house all exhibits. The exposition opens at 12 noon, closes at 10:30 p.m. on Monday, Tuesday and Wednesday. Hours on Thursday and Friday are 10 a.m. to 6 p.m. Here are the exhibitors and the booths they will occupy:

Aaron Machinery Co., Inc., New York	2224
Abaco Industries Inc., Elmhurst, N. Y.	2434
Acetogen Gas Co., Detroit	2656
Acme Steel Co., Chicago	1933
Acme Tool Co., New York	715
Adamas Carbide Corp., Kenilworth, N. J.	1747
Advance Glove Mfg. Co., Detroit	2803
Aeronautical Service Engineering, Albertson, N. Y.	2751
Aeroprojects Inc., West Chester, Pa.	2333
Ajax Electric Co., Philadelphia	1609
Ajax Electrothermic Corp., Trenton, N. J.	1609
Ajax Engineering Corp., Trenton, N. J.	1609
Aldridge Industrial Oils Inc., Cleveland	525
Al-Fin Division, Fairchild Engine & Airplane Corp., Deer Park, N. Y.	2324
Allegheny Ludlum Steel Corp., Brackenridge, Pa.	451
Allis-Chalmers Mfg. Co., Buda Division, Milwaukee	2509
Allison Division, American Chain & Cable Co. Inc., Bridgeport, Conn.	1816
Alloy Engineering & Casting Co., Champaign, Ill.	936
American Cast Iron Pipe Co., Birmingham	2144
American Chemical Paint Co., Ambler, Pa.	2332
American Cyanamid Co., New York	1501
American Cystoscope Makers Inc., Borescope Division, New York	2836

...chances are
PRESTOLE HAS IT!

PRESTOLE Single or Multiple impression fasteners, having a variety of sizes and shapes, can be used to speed up, simplify and add greater strength to attachments involving one or more hole locations.

Typical applications include hinges, baffles, switch boxes and assemblies, radiator grilles and similar specialized components requiring one or more hole locations for regular or blind fastening.

These PRESTOLE fasteners, featuring the outstanding PRESTOLE impression, can be made to special specifications. In most cases new tooling is not required. Therefore, quantity delivery to your production is possible immediately, and costs are reduced.

PRESTOLE is solving fastening problems at an average rate of 15 per week. Over the years, PRESTOLE engineers have solved thousands of problems involving fasteners used in automobiles, refrigerators, stoves, radios, television sets and similar products of daily use by the public.

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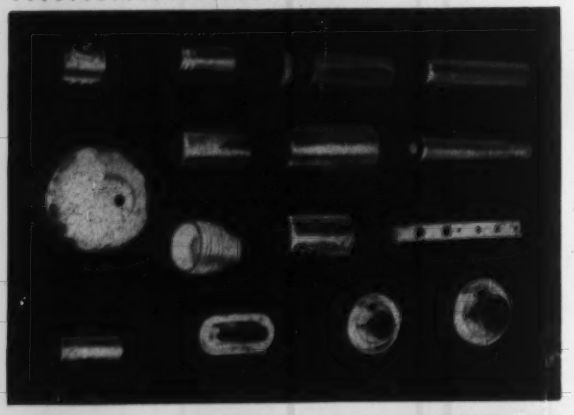
Application

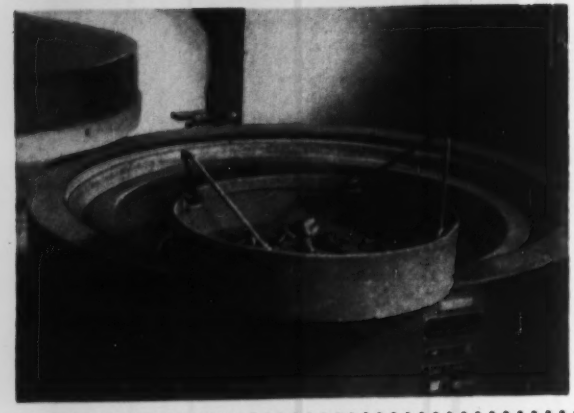
Replaces Cadmium Plating . . . These grey cast iron valve bodies are used in the pneumatically operated sanders that deliver sand for improved traction under the wheels of trains, trolleys and trucks. Their manufacturer had a double-barreled problem . . . porosity in the castings was causing excessive rejects . . . expensive cadmium plating was necessary to prevent corrosion in service.

Steam treating has solved both problems in one operation. Rejects due to porosity have been eliminated, and many valves previously rejected have been salvaged. Cadmium plating has been eliminated entirely because exhaustive salt spray tests showed the steam-treated finish had a higher resistance to corrosion.



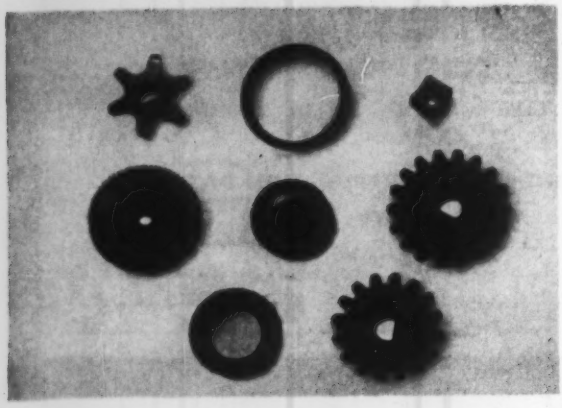
Cuts Expensive Pickling Costs . . . Non-ferrous lipstick tubes and other cosmetic containers made by a large Canadian manufacturer must be annealed before finishing operations can be performed. Scale was a problem. If left on, it ruined tools and dies . . . removing it meant expensive, messy pickling.

The solution was found when sample parts were annealed by the steam Homo® method. When this method was adopted as an integral part of the production line, pickling was eliminated. Subsequent figures from the cost-accounting department showed that eliminating this operation reduced annealing cost by 53 percent.



Puts "Extra-Life" in Cutting Tools . . . A machinery manufacturer faced a tough problem when specifications called for milling a 0.250 inch wide key-way slot into a piece of 4140 cold-rolled bar stock which was heat treated to a hardness of Rc 34 to 38. In addition, tolerances were tight . . . ±0.001 inch . . . with sides perfectly square.

The first high-speed steel tools used produced only four cuts and could not be resharpened because of the close tolerance. Hard-chroming the same tools improved cutter life to about 11 pieces per tool. Carbide tools held up for from 11 to 14 pieces. The next move was steam treating experimental batches of tools in an L&N furnace. The first batch averaged 100 parts per cutter, a second batch, 60 to 70 and a third lot, 100 to 125.



Raises "psi" of Powdered Iron Parts . . . Although many parts made of powdered iron function satisfactorily in the as-sintered condition, there are others where an increase in hardness and compressive strength is an advantage.

This is particularly true of such parts as the steam-treated gears, cams, etc., shown at left, where additional strength is needed on critical bearing surfaces. The shock-absorber piston in the center, for instance, presented a real problem . . . how to meet psi specifications for the thin-section flange around the outer edge. Steam treating proved a cheap, practical solution. Tests showed compressive strength of the flange increased from 1200 to 1400 psi. In addition, the parts, when oil dipped, had a pleasing uniform, blue-black color and high corrosion resistance.

Is steam treating an "unknown-quantity" to you?

If you work with metal . . . ferrous or non-ferrous . . . and haven't considered steam atmosphere heat treating for your product, you may find you've overlooked an unsuspected source of surprisingly substantial savings.

For in scores of plants it's becoming an outstanding cost-cutter on parts made of high speed steel, powdered iron, carbon steel, grey iron, brass aluminum and beryllium copper. And its advantages are almost as numerous as the materials being steam treated.

On high speed cutting tools, for instance, it keeps tools sharp longer. On powdered iron, compressive strength and hardness increase appreciably. On carbon steel it gives a uniform, attractive, blue-black finish. On grey iron it seals against porosity and gives a high degree of corrosion resistance. On non-ferrous parts it produces scale-free work ready for bright dip or often for use "as-is."

Here and on the opposite page are just four examples to illustrate our point. If you want others . . . or details on any of these . . . or want us to help investigate possible savings you can make, just phone your nearest L&N office or write us at 4957 Stenton Ave., Phila. 44, Pa. Catalog TD2-620(1) tells all about it, too; we'll be glad to send you a copy.

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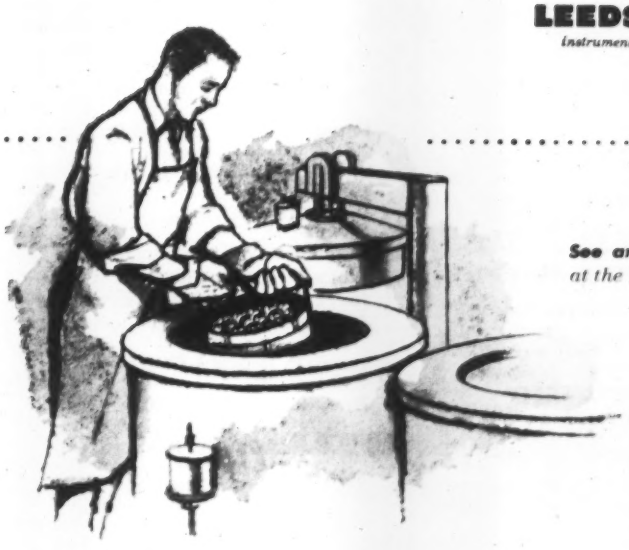
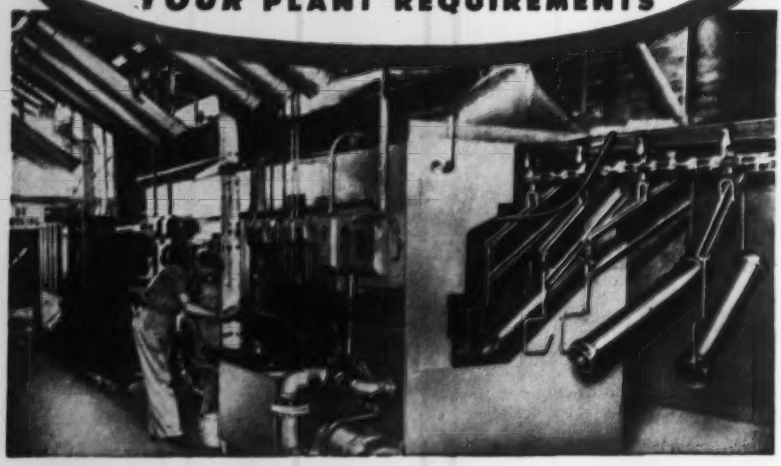
instruments *automatic controls* • *furnaces*



See an operating demonstration *at Booth 1129 at the Metal Show in Cleveland October 8 to 12.*

A-F JOB ENGINEERS INTEGRATED CONVEYING AND PROCESSING SYSTEMS TO MEET YOUR PLANT REQUIREMENTS



WHY ORDER a Conveying System from one company and Cleaning and Processing Machines from another?

INTEGRATED A-F FACILITIES are at your service

Alvey-Ferguson is unique among all manufacturers in being able to offer you a Conveying System completely co-ordinated with your Cleaning and Processing Machines . . . all A-F Engineered to your plant's requirements.

BEFORE YOU ORDER, write us. Let us prove how the integration of an A-F Engineered Overhead Trolley Conveyor System with A-F Engineered Cleaning and Processing Machines will move metal parts and products through your plant at the most efficient pre-determined rate of speed for "quality control" and lowest cost production. Write, without obligation, for new A-F brochures—today.

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A-F ENGINEERED CONVEYING SYSTEMS

Also Pre-Engineered Conveyors—
Wheel, Trolley, Roller, Belt
Metal Cleaning and Processing Machines

YOU CAN SEE THE SUPERIORITY OF A-F CONVEYOR ENGINEERING

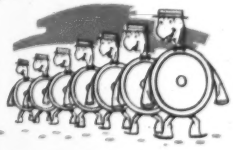
THE ALVEY-FERGUSON CO., 674 Disney St., CINCINNATI 9, OHIO and Azusa, California

Exhibitor	Booth No.
American Gas Association, New York	2859
American Gas & Electric Service Corp., New York	2007
American Gas Furnace Co., Elizabeth, N. J.	2841
American Herforder Corp., Chicago	2033
American Machinist, New York	2406
American Metal Market Co., New York	1745
American Optical Co., Buffalo	1136
American Positive Grip Vise Corp., Willimansett, Mass.	2773
American Pullmax Co. Inc., Chicago	2521
American Silver Co., Industrial Metals Division, Flushing, N. Y.	930
American Society for Metals, Cleveland	240, 1706
Amperex Electronic Corp., Hicksville, N. Y.	2635
Apex Tool & Cutter Co. Inc., Shelton, Conn.	2816
Applied Research Laboratories, Glendale, Calif.	2112
Arcweld Mfg. Co., Grove City, Pa.	2302
Aro Spotwelder Division, Guthery Machine Tool Corp., Long Island City, N. Y.	2733
Ashworth Bros. Inc., Winchester, Va.	2660
ASM Technical Books, Cleveland	1411
Assembly Products Inc., Chesterland, O.	1702
Atlas Mineral Products Co., Mertztown, Pa.	2729
Audubon Wire Cloth Corp., Philadelphia	2728
Automation, Cleveland	1425
Automotive Industries, Philadelphia	1402
Babcock & Wilcox Co., Tubular Products Division, Beaver Falls, Pa.	522
Baird Associates—Atomic Instrument Co., Cambridge, Mass.	1234
Balcrank Inc., Industrial Pump & Equipment Division, Cincinnati	521
Baldwin-Lima-Hamilton Corp., Waltham, Mass.	2104
Balteau Electric Corp., Stamford, Conn.	2622
Banner Welder Inc., Milwaukee	2769
Barer Engineering & Machinery Co. Ltd., Montreal, Que.	2318
Battelle Memorial Institute, Columbus, O.	542
Bausch & Lomb Optical Co., Rochester, N. Y.	422
Morris Bean & Co., Yellow Springs, O.	920
Bede Products Corp., Amherst, O.	1101
Beryllium Corp., Reading, Pa.	1834
Binks Mfg. Co., Chicago	2755
Black Drill Co. Inc., Cleveland	914
G. S. Blakeslee & Co., Cicero, Ill.	1019
Henry P. Boggis & Co., Cleveland	2874
Branson Ultrasonic Corp., Stamford, Conn.	2145
C. A. Brinkmann & Co. Inc., Great Neck, N. Y.	201
Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Philadelphia	312
Brush Beryllium Co., Cleveland	531

BOY!

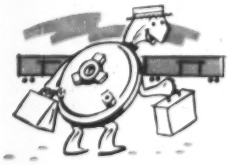
LYNCHBURG FOUNDRY
SHELL CASTINGS
SAVE SAVE SAVE!

GRAY IRON AND DUCTILE IRON—Production castings up to 75 pounds

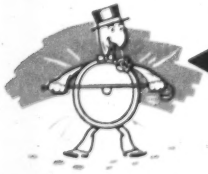


GREATER UNIFORMITY—They don't have to spend so much time getting ready to grind on me, and my shell has a better chance of pulling through the machine shop operation. Sometimes my shell has to be balanced, and the greater uniformity saves on this operation too . . .

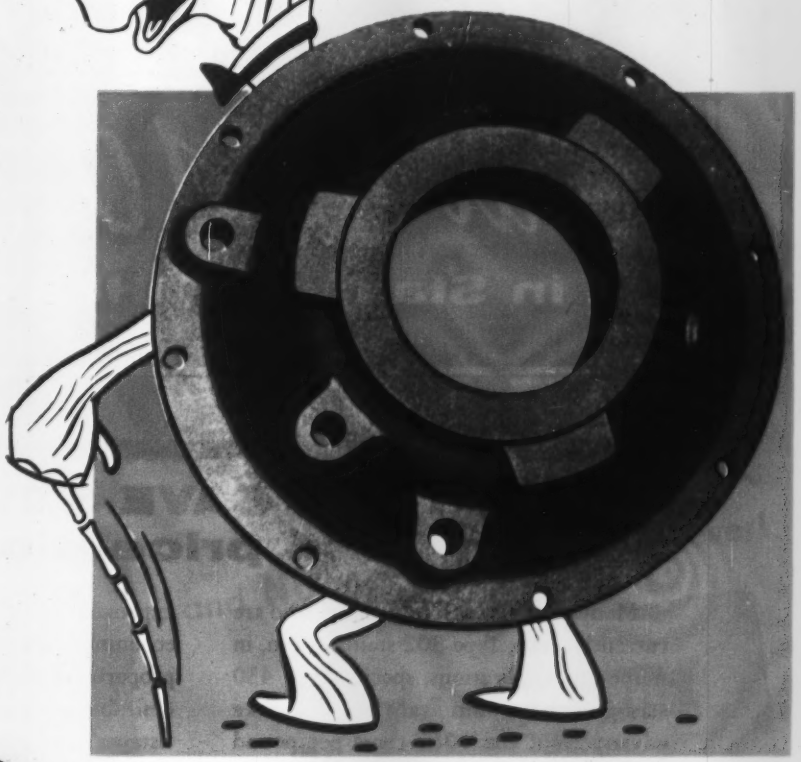
LESS MACHINING—Fewer backaches! Close control of dimensions makes for less machining, faster machining methods, or in some instances elimination of machining altogether.



MADE FOR LIGHT TRAVEL—My Lynchburg Foundry shell surely makes for cheaper transportation fares — less machine stock makes me a "Light-Weight".



SUPERIOR SURFACE FINISH—I call it "eye appeal"—I really feel sharp in my Lynchburg Foundry shell molded shell. Saves wear on machine tools too.



You can't tell us turtles much about this shell game—we've been in it a long time—but I'd sure like for my whole family to hear about Lynchburg Foundry shell castings.

The snazzy outfit I'm wearing is called a gear box cover—shell molded, of course. You ought to have seen all the things that had to be done to an outfit like mine in the old days—before shell molding. But all that's changed—even the bolt holes around the edge are cast in. Then too, the pipe tap holes are cast so accurately that the drilling operation, which normally precedes the pipe tapping operation, is eliminated. And the machining that has to be done takes a lot less time—there's less machine stock, and the chucking lugs are cast so accurately.

As one shell man to another, take my advice—specify Lynchburg Foundry shell castings.

VISIT OUR BOOTH NO. 1519—NATIONAL METAL EXPOSITION—OCT. 8 THRU 12

LYNCHBURG FOUNDRY CO., Lynchburg, Virginia

DISTRICT SALES OFFICES:

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Simple Arithmetic...
Type 302, Sheet Base Price 47.50 cents per lb.
Type 430, Sheet Base Price -36.75 cents per lb.
Saving 10.75 cents per lb.
in Stainless SHEET Costs!

Now you can SAVE $215 per ton in base price alone!

Many designers and fabricators who are currently using Type 302 stainless can, in numerous applications, specify Type 430 straight chromium stainless and take advantage of the 10¾ cents per pound difference in base price. Some of our customers are already saving more than $215 per ton using our 430 MicroRold stainless sheet.

The steel industry estimates that 50% of all stainless sheet applications could satisfactorily employ Type 430, the least expensive of all stainless grades, as an economical and practical material. When properly applied, Type 430 has all the desirable qualities of beauty, corrosion resistance, strength, long life and low maintenance that no other material, except stainless, can offer.

We are currently producing our MicroRold Type 430 sheets up to 48" wide in thicknesses .005" to .109" with 2B or 2D finishes; and in thicknesses .010" to .109" in No. 3, 4 and 7 finishes.

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Brush Electronics Co., Sub. of Clevite Corp., Cleveland	1726
Buck Mfg. Co., Los Gatos, Calif.	2546
Buck Tool Co., Kalamazoo, Mich.	1528
Budd Co., Gamma Division, Philadelphia	1707
Buehler Ltd., Evanston, Ill.	260
Cadmet Corp., Detroit	2667
Cam-Lok Division, Empire Products Inc., Cincinnati	2520
Cammann Mfg. Co., Cleveland	1737
Campbell Machine Division, American Chain & Cable Co. Inc., Bridgeport, Conn.	1816
Carbide & Carbon Chemicals Co., division, Union Carbide & Carbon Corp., New York	1608
Carlingo Commodities Corp., New York	2107
Carter Controls Inc., Lansing, Ill.	803
Central Foundry Division, General Motors Corp., Saginaw, Mich.	2134
Chicago Rivet & Machine Co., Bellwood, Ill.	2529
Chilton Co., Philadelphia	1402
Cincinnati Sub Zero Products, Cincinnati	2573
Circo Equipment Co., Clark, N. J.	2101
Cities Service Petroleum Inc., New York	1229
Clementina Ltd., San Francisco	2673
Cleveland Designers & Consultants Inc., Cleveland	2873
Cleveland Electric Illuminating Co., Cleveland	911
Cleveland Grinding Machine Co., Cleveland	337
Cleveland Metal Abrasive Co., Cleveland	1908
Climax Molybdenum Co., New York	360
Cold Metal Products Co., Youngstown	1120
Collins Microflat Co. Inc., Los Angeles	939
Commander Mfg. Co., Chicago	736
Consolidated Electrodynamics Corp., Consolidated Vacuum Division, Rochester, N. Y.	1929
Continental Drill Corp., Chicago	532
Continental Industrial Engineers Inc., Chicago	2831
Cooper Metallurgical Associates, Cleveland	1033
Copperweld Steel Co., Steel Division, Warren, O.	311
Crane Packing Co., Morton Grove, Ill.	2617
Dake Corp., Grand Haven, Mich.	2554
Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh	1916
A. P. de Sanno & Son Inc., Phoenixville, Pa.	1942
Detrex Chemical Industries Inc., Detroit	1907
Detroit Testing Machine Co., Detroit	1806
DeWalt Inc., Lancaster, Pa.	2670
Dilley Mfg. Co., Cleveland	810
Di-Met Corp., Torrance, Calif.	2854
Henry Disston Division, H. K. Porter Company Inc., Philadelphia	2731
Diversey Corp., Chicago	1012
Dixon Sintaloy Inc., Stamford, Conn.	2774
Doehler-Jarvis Division, National Lead Co., Toledo, O.	2111

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You lose **NO** time when you use LAMINUM SHIMS...

NO machining!

NO grinding!

NO counting!

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NO miking!

...and **NO** dirt between layers—ever!

LAMINUM®
SURFACE BONDED... THEY peel FOR ADJUSTMENT

Laminated Shims of **LAMINUM** now available in

STAINLESS STEEL with laminations of .002" or .003"	**ALUMINUM** with laminations of .003" only
BRASS with laminations of .002" or .003"	**LOW CARBON STEEL** with laminations of .002" or .003"

LAMINATED SHIM COMPANY, INC.
Shim Headquarters since 1913
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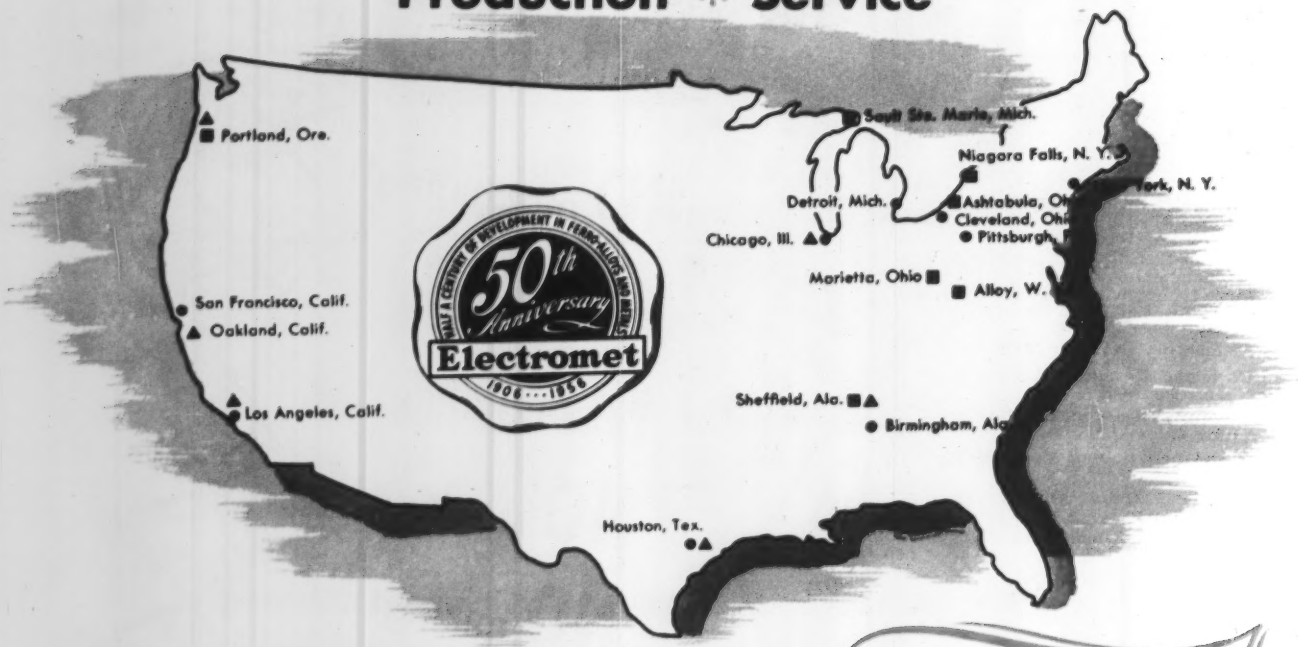


● Sales and Service Offices
■ Plants
▲ Warehouses

For 50 years ELECTROMET has produced ferro-alloys and metals essential in the production of steel, iron, and non-ferrous metals. Research and development by ELECTROMET during these 50 years have provided the trade with new and better alloys and metals to meet specific needs. Increased emphasis on research and development promises continued benefits in the future.

The ELECTROMET story is one of steady growth and progress for the benefit of the metal industries. When you buy from ELECTROMET, you get the best in alloys and service plus the advantages of long manufacturing experience and extensive research.

Here are some of the advantages you get from ELECTROMET's *integrated programs.*

Competent Metallurgists and Sales Engineers

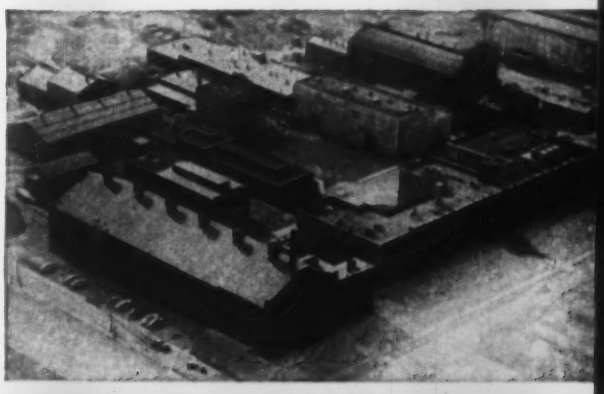
Nine sales and service offices are strategically located in the major steel producing centers as shown on the map above. If you have a problem on metals or alloys, let one of our experienced metallurgists or sales engineers help you. He will be glad to assist you with any problems on the production of quality steels, irons, and non-ferrous metals. Simply telephone or write the ELECTROMET office nearest you.

B Ca Cb Cr Mn Si Ti V W Zr

50 Years of Experience

Continuing Research and Development

Since 1906 ELECTROMET has carried on a three-way program of research, development, and technical service. More than 300 skilled research scientists, engineers, and technicians work in ELECTROMET's Metals Research Laboratories and Development Laboratories at Niagara Falls (shown here). This program provides you with new ferro-alloys and metals, better ways of using them, and new and improved alloy steels and irons. Innovations are fully developed in our laboratories before they are offered commercially.



Wide Range of Alloys to Meet Your Needs

Over 50 different products are manufactured to meet the regular requirements of the metal industry as well as the special needs of customers. This wide range of high-quality ferro-alloys and metals is the result of 50 years of research, development, and service by ELECTROMET. ELECTROMET offers the widest selection of ferro-alloys and metals to meet your specific requirements.

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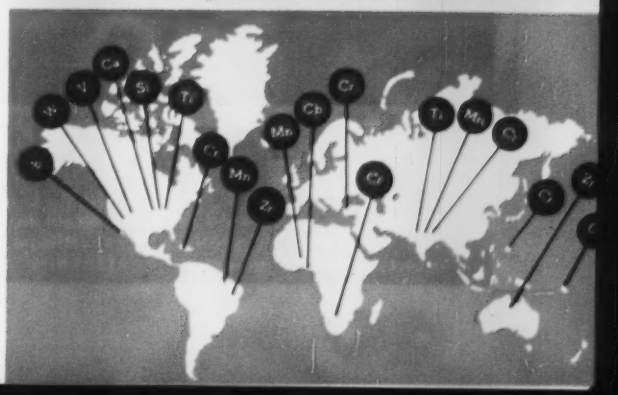
Our plants have been greatly expanded and modernized to meet the current demands for ferro-alloys and metals. The recently completed plant at Marietta, Ohio, is the world's largest ferro-alloy plant. Company-owned power facilities at four of the plants assure a constant supply of power for efficient production. Prompt shipment of ELECTROMET ferro-alloys is assured from all seven plants, and from six warehouses conveniently located to serve you.

World Wide Ore Sources

The availability of ores, and other raw materials is assured by ELECTROMET's diverse facilities, including mines and ore milling plants owned by UNION CARBIDE. Helping to assure adequate ore supplies are the ore buying facilities of Union Carbide Ore Company, a Division of Union Carbide and Carbon Corporation. Ores come from the far corners of the earth to ELECTROMET's plants. On this simplified map of the world, symbols for the chemical elements indicate a few of the major sources of alloy ores.



ELECTRO METALLURGICAL COMPANY

A Division of Union Carbide and Carbon Corporation

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In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

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PARTS LAST LONGER . . . if they're centrifugally cast by the Shenango process. Tougher parts because of finer, pressure-dense grain, greater strength, better elongation and freedom from sand inclusions and blow holes. There's minimum waste, less machining. The large bronze liner and seat ring shown here are typical of various parts, large and small, ferrous and non-ferrous, regularly produced in Shenango's modern plant. Informative bulletins give all the facts. Write to: Centrifugally Cast Products Division, The Shenango Furnace Company, Dover, Ohio.
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Driver-Harris Co., Harrison, N. J.	2411
Drop Forging Association, Lansing, Mich.	2530
DuBois Co. Inc., Cincinnati	2423
E. I. du Pont de Nemours & Co., Wilmington, Del.	1030
Dynamic Gear Co. Inc., Amityville, N. Y.	2871
Easco Products Division, Electro Arc Sales Co., Ypsilanti, Mich.	1204
Eastman Kodak Co., Rochester, N. Y.	1002
East Shore Machine Products Co., Euclid, O.	2560
Eclipse Fuel Engineering Co., Rockford, Ill.	1724
Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J.	2123
Electric Furnace Co., Salem, O.	1041
Electro-Alloys Division, American Brake Shoe Co., Elyria, O.	215
Electro Metallurgical Co., division, Union Carbide & Carbon Corp., New York	1608
Elox Corp. of Michigan, Royal Oak, Mich.	2131
Enamelstrip Corp., New York	2628
Engelburg Huller Co. Inc., Syracuse, N. Y.	2746
Engineered Castings Division, American Brake Shoe Co., Rochester, N. Y.	215
Ercona Corp., New York	937
Eriez Mfg. Co., Erie, Pa.	2716
Exomet Inc., Conneaut, O.	2571
Fabristeel Products Inc., Detroit	1421
Falcon Tool Co., Detroit	2667
Fawick Airflex Division, Fawick Corp., Cleveland	1934
Fenn Mfg. Co., Newington, Conn.	331
Fenway Machine Co. Inc., Philadelphia	1204
Ferrotherm Co., Cleveland	536
Forest City Foundries Co., Cleveland	2856
Foundry, Cleveland	1425
Fulton Foundry & Machine Co., Cleveland	2753
Gas Appliance Service Inc., Chicago	2837
Gas Machinery Co., Cleveland	2833
Gasway Corp., Chicago	2864
General Alloys Co., Boston	351
General Electric Co., Apparatus Sales Division, Schenectady, N. Y.	305
General Electric Co., X-Ray Department, Milwaukee	1104
General Riveters Inc., Buffalo	2616
General Ultrasonics Co., Hartford, Conn.	2866
B. F. Goodrich Co., Aviation Products Division, Akron	2535
Graham Machine Tool Co., New York	2403
Graham Transmissions Inc., Menomonee Falls, Wis.	804
Gray Co. Inc., Minneapolis	2618
Gries Reproducer Corp., New Rochelle, N. Y.	550
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Wm. J. Hacker & Co. Inc., New York	1709
Hamler Industries Inc., Chicago	907

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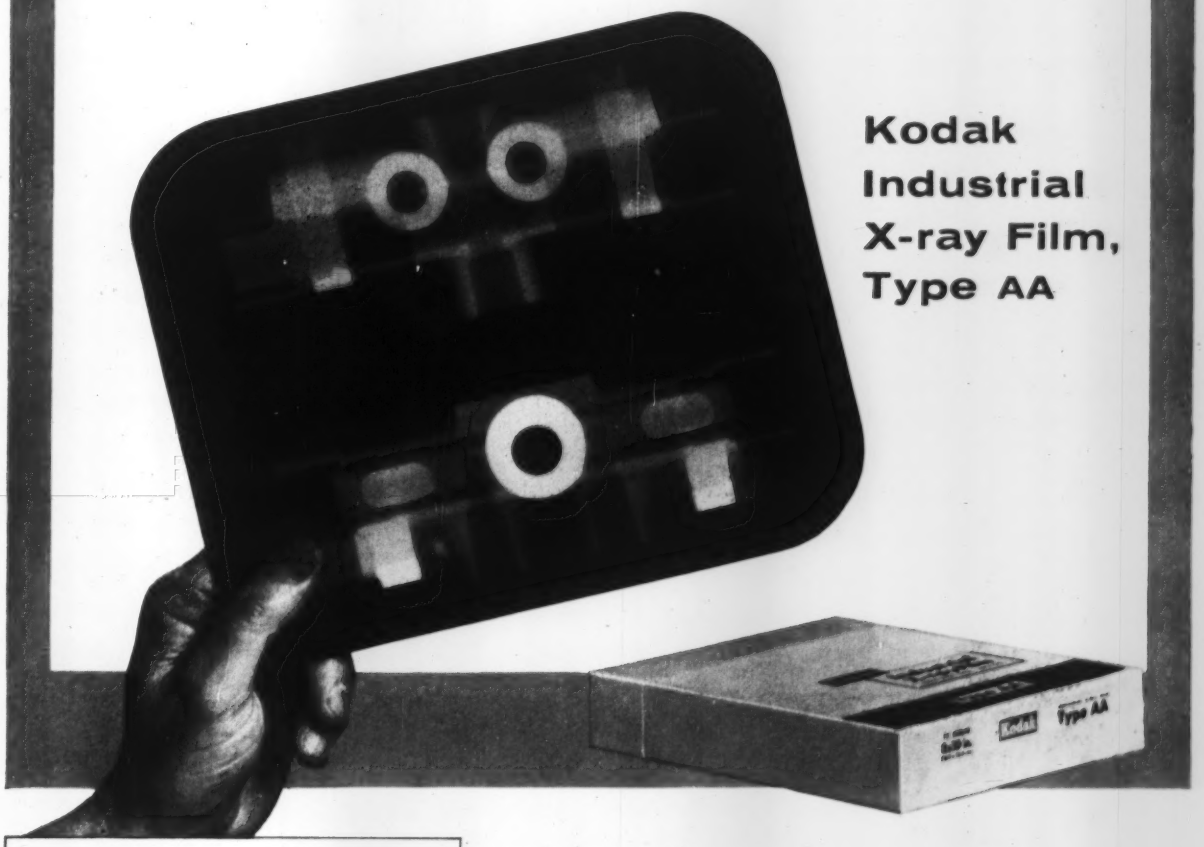
gives greater detail with usual exposure times



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- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

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X-ray Division
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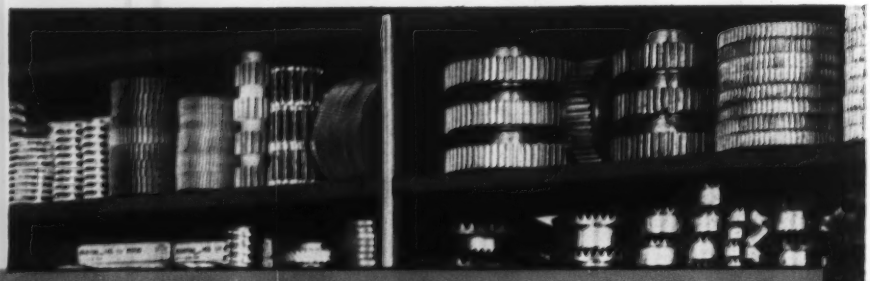

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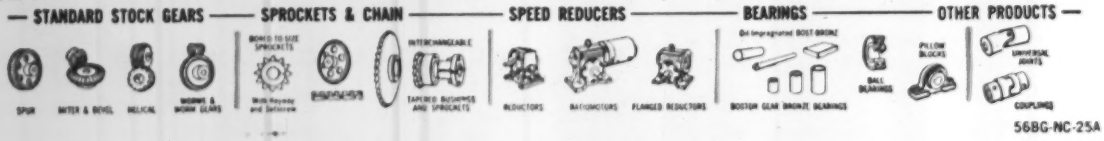

56BG-NC-25A

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F. Ward Harman Associates, Halesite, N. Y.	2718
Harper Electric Furnace Corp., Buffalo	724
Harris Calorific Co., Cleveland	223
Harshaw Scientific Division, Harshaw Chemical Co., Cleveland	2647
Haynes Stellite Co., division, Union Carbide & Carbon Corp., New York	1608
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Heil Process Equipment Corp., Cleveland	2766
Heli-Coil Corp., Danbury, Conn.	2415
Hevi-Duty Electric Co., Milwaukee	209
High Vacuum Equipment Corp., Hingham, Mass.	2702
High Voltage Engineering Corp., Cambridge, Mass.	720
Hobart Bros. Co., Troy, O.	2541
Holcroft & Co., Detroit	346
A. F. Holden Co., Detroit	1415
Holger Andreasen Inc., San Francisco	537
Chas. A. Hones Inc., Baldwin, N. Y.	2857
E. F. Houghton & Co., Philadelphia	1145
Howard Foundry Co., Chicago	212
Huck Mfg. Co., Detroit	2805
Illinois Testing Laboratories Inc., Chicago	1214
Industrial & Scientific Products Division, Curtiss-Wright Corp., Wood-Ridge, N. J.	2032
Industrial Equipment News, New York	2869
Industrial Heating, Pittsburgh	2765
Industrial Heating Equipment Co., Detroit	2561
Industrial Press, New York	1729
Industrial Publishing Group, Cleveland	801
Industrial Tectonics Inc., Ann Arbor, Mich.	2517
Industry and Welding, Cleveland	801
Instron Engineering Corp., Quincy, Mass.	2430
International Nickel Co. Inc., New York	402-408
Invincible Vacuum Cleaner Mfg. Co., Dover, O.	2703
Ipsen Industries Inc., Rockford, Ill.	321
Iron Age, Philadelphia	1402
Ivy Co., Norwalk, Conn.	2008
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Jarrell-Ash Co., Newtonville, Mass.	1111
Jergens Tool Specialty Co., Cleveland	2572
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Jiffy Disintegrators Inc., Royal Oak, Mich.	2761
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L. R. Kerns Co., Chicago	2547
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Kinney Mfg. Division, New York Air Brake Co., Boston	728
Kirkhof Mfg. Co., Grand Rapids, Mich.	2860

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Reduce your cost by using forgings. Send for booklets, ☐ "What is a Forging?" and ☐ "Management Guide to the Use of Forgings."

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Better clamping system—Clamp faces are directly opposite one another to give positive clamping action without bending the rod.

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Why you get more service from V-Belts with CONCAVE SIDES

Fig. 1

Fig. 1-A

Each sidewall of a Gates V-belt is concave (Fig. 1)—a precisely engineered curve that makes V-belts last far longer.

HERE'S WHY: on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*. This even contact distributes wear uniformly across the sides of the belt.

Uniform wear lengthens belt life; keeps costs down.

MAKE THIS SIMPLE TEST

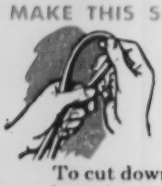

Fig. 2

Fig. 2-A

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the pulley groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope—the V-belt with concave sides. There is a Gates distributor nearby who will quickly supply the belts you need. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

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Gates

TPA 109

Gates VULCO ROPE Drives

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Kux Machine Co., Chicago	1420
Laboratory Equipment Corp., St. Joseph, Mich.	2655
Lake Shore Inc., Iron Mountain, Mich.	2542
Lakeside Steel Improvement Co., Cleveland	306
K. O. Lee Co., Aberdeen, S. Dak.	2044
Leeds & Northrup Co., Philadelphia	1129
E. Leitz Inc., New York	702
Lempco Products Inc., Bedford, O.	1236
Lepel High Frequency Laboratories Inc., Woodside, N. Y.	2211
Lewis Machine Co., Cleveland	2002
Lincoln Electric Co., Cleveland	440
Lindberg Engineering Co., Chicago	431
Linde Air Products Co., division, Union Carbide & Carbon Corp., New York	1608
Loftus Engineering Corp., Pittsburgh	2650
Logansport Machine Co. Inc., Logansport, Ind.	2207
Los Angeles Department of Water & Power, Los Angeles	2329
Lufkin Rule Co., Saginaw, Mich.	1721
Lynchburg Foundry Co., Lynchburg, Va.	1519
M.B.I. Export & Import Ltd., New York	2312
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Machinery, New York	1729
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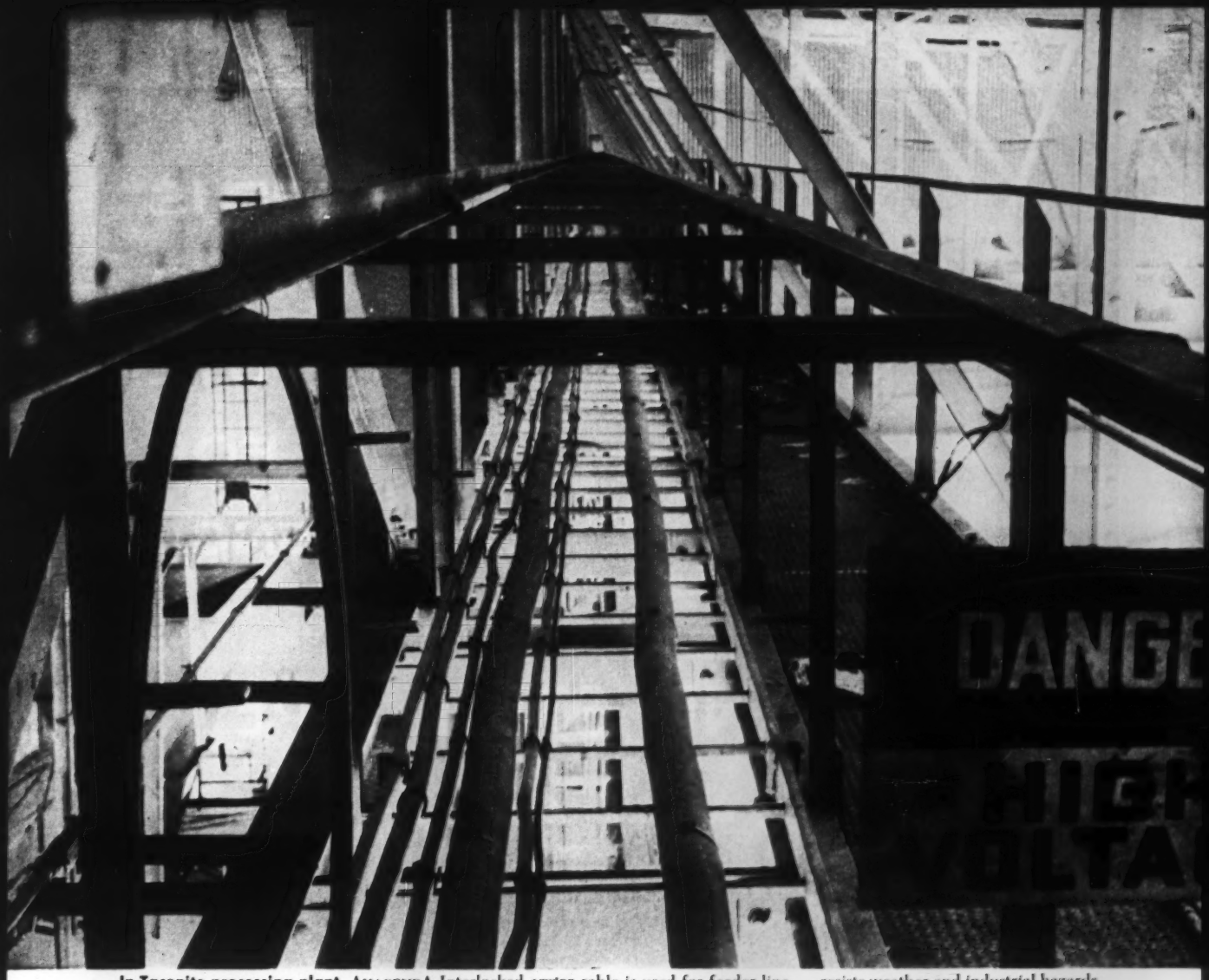
Magnaflux Corp., Chicago	231
Magnethermic Corp., Youngstown	2338
Magnetic Analysis Corp., Long Island City, N. Y.	1235
Malayan Tin Bureau, Washington	2410
Man-Au-Cycle Corp. of America, Brooklyn, N. Y.	2526
Manufacturers Processing Co., Detroit	2821
Marquette Metal Products Division, Curtiss-Wright Corp., Cleveland	2032
Martindale Electric Co., Cleveland	1212
Martin Grinding & Machine Works, Chicago	454
McGraw-Hill Publishing Co., New York	2406
Melard Mfg. Corp., New York	1734
Metal Carbides Corp., Youngstown	2024
Metallizing Co. of America, Chicago	506
Metallizing Engineering Co. Inc., Westbury, N. Y.	2233
Metallurgical Inc., Minneapolis	818
Metallurgical Products Department of General Electric Co., Detroit	2124
Metals Engineering Institute, Cleveland	1706
Metals Processing Division, Curtiss-Wright Corp., Buffalo	2032
Metal Progress, Cleveland	240
Metal Removal Co., Chicago	2033
Metals Review, Cleveland	1706
Met-L-Chek Co., Pittsburgh	704
Metalwash Machinery Corp., Elizabeth, N. J.	2847



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Minneapolis-Honeywell Regulator Co., Industrial Division, Philadelphia	312
Minnesota Mining & Mfg. Co., St. Paul	2822
Modernair Corp., San Leandro, Calif.	2609
Mohawk Tools Inc., Montpelier, O.	716
Murdoch Laboratories Division, Blackstone Corp., Jamestown, N. Y.	2552
Naresco Equipment Corp., Newton Highlands, Mass.	2108
National Carbon Co., division, Union Carbide & Carbon Corp., New York	1608
National Cored Forgings Co. Inc., South Norwalk, Conn.	445
National Malleable & Steel Castings Co., Cleveland	1703
National Precision Casting Corp., Clifton Heights, Pa.	2828
National Spectrographic Labs., Cleveland	2830
National-Standard Co., Niles, Mich.	2608
National Torch Tip Co., Pittsburgh	2632
Nelson Stud Welding Division, Gregory Industries Inc., Lorain, O.	1930
New Equipment Digest, Cleveland	1425
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NRC Equipment Corp., Newton Highlands, Mass.	2108
Oakite Products Inc., New York	941
Ohio Hydro Deburring Co., Cleveland	2564
Ohio Metal Working Products Co., Canton, O.	505
Ohio Nut & Bolt Co., Berea, O.	2760
Ohio Seamless Tube Division, Copperweld Steel Co., Shelby, O.	311
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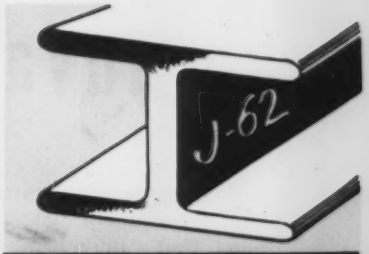
Park Chemical Co., Detroit	1515
Geo. C. Patterson Machine Co., Cleveland	2442



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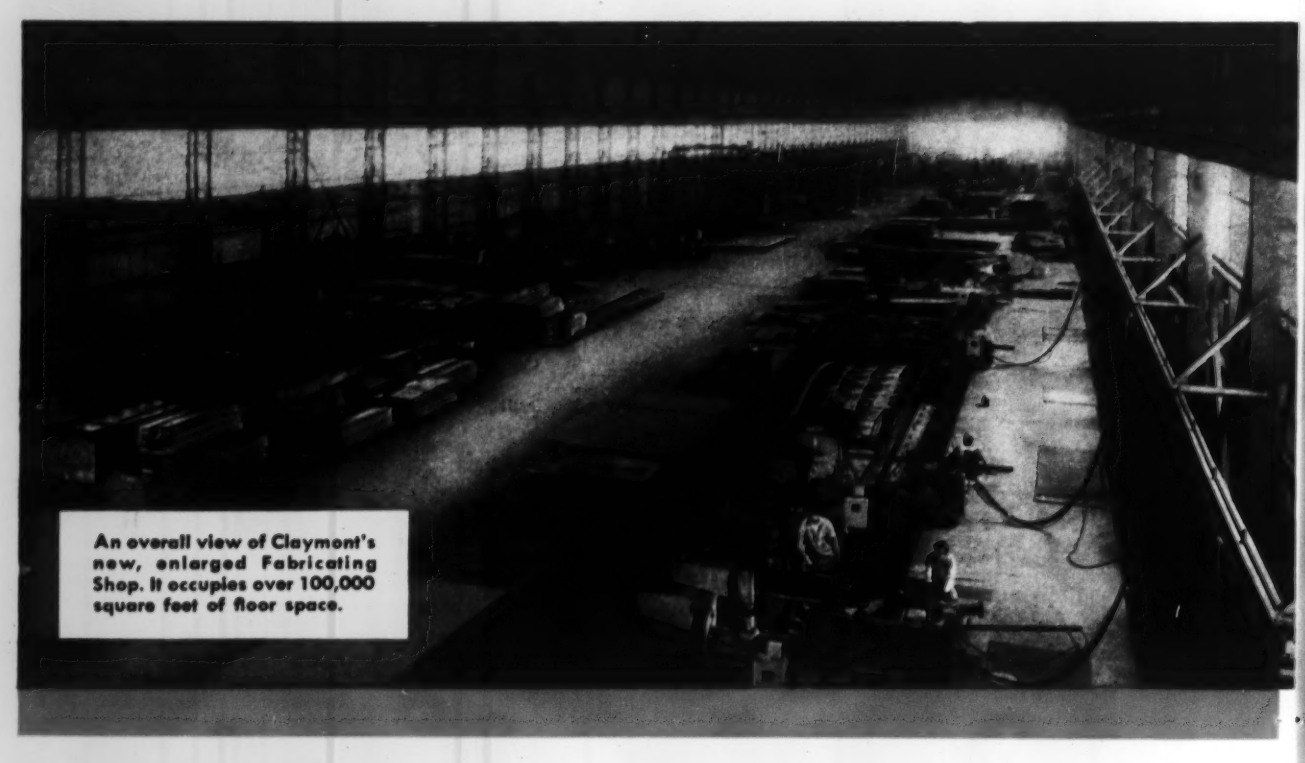
What does this mean to you? It means that, before the steel ever leaves the mill, Claymont can perform the fabricating operations you don't want to handle. This eliminates needless scrap . . . stops freight, storage and handling costs on metal you can't use . . . enables you to make better use of your capital by reducing your needs for seldom-used patterns and equipment . . . and assures you of a constant steel supply from Claymont's widespread producing facilities.

For further details, contact your nearby CF&I representative or write today to Wickwire Spencer Steel Division, The Colorado Fuel and Iron Corporation, P. O. Box 1951, Wilmington, Delaware.



An overall view of Claymont's new, enlarged Fabricating Shop. It occupies over 100,000 square feet of floor space.

CF&I

Claymont Steel Products

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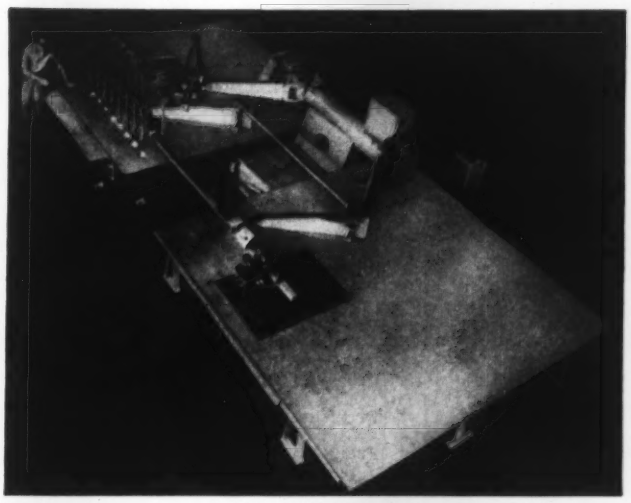
steel fabricating service



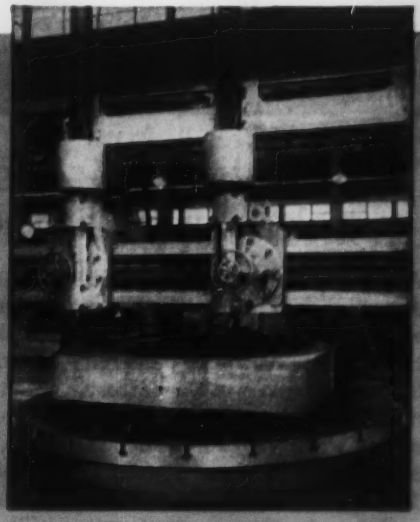
One of Claymont's multi-torch travographs which are used to produce a wide variety of flame-cut steel plate shapes.

Can you use this Claymont machinery?

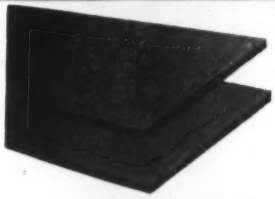
- Multi-torch Travographs
- Radiographs
- Special Edge Preparation Burning Equipment
- Heavy Duty Shears
- Bending Roll
- Press Brake
- Mechanical Presses
- Vertical Punching Equipment
- Vertical Boring Mill
- Radial Drills
- Vertical Milling Equipment
- Surface Grinding Equipment
- Do-ALL Saw
- Horizontal Turning Equipment

← Claymont's new shop is equipped with several mechanical presses, including this one having an 800-ton capacity.

→ This 16-foot vertical boring mill enables Claymont to perform operations which are impractical for the average fabricating plant.

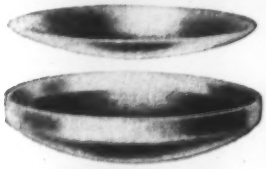


OTHER CLAYMONT PRODUCTS

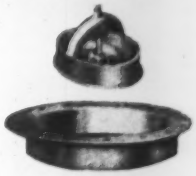


Steel Plates

Alloy • High Strength Low Alloy
Stainless-Clad • Nickel Plated



Flanged and Dished Heads



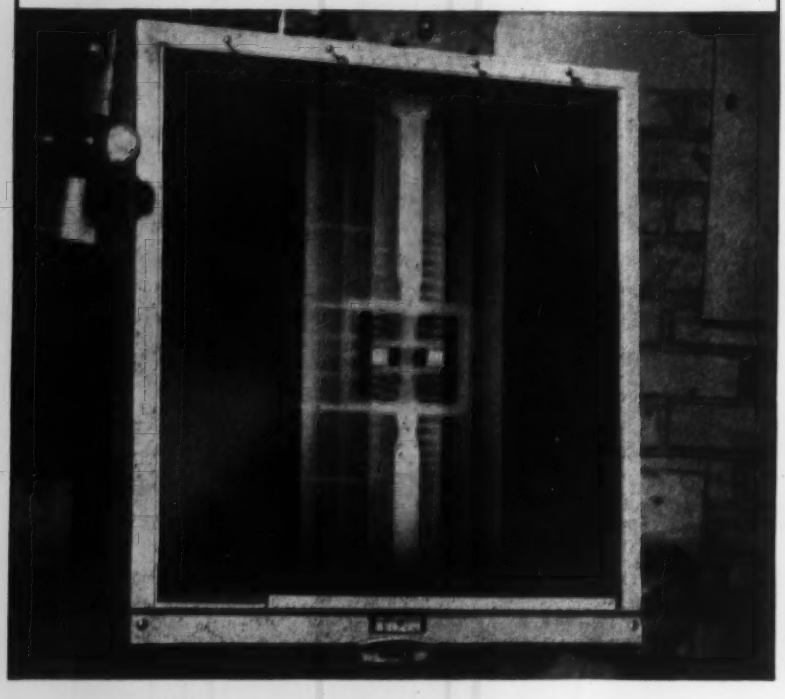
Manhole Fittings and Covers

4258

Large Diameter Welded Steel Pipe

THERMALLOY* quality control at work

hell box



This test bar is burning up . . . to make your furnace parts last longer

Above is an actual radiograph of an experimental alloy being subjected to extreme temperature conditions in our research laboratories. We use a battery of creep-testing furnaces to test alloys with varying loads . . . at temperatures ranging from 1200° to 2250° F.

Creep-testing is just one phase of Electro-Alloys Research and Quality Control. Our Elyria plant has a completely equipped laboratory for metallurgical study of any problem involving high-heat-resistant parts.

Let us put our facilities to work to solve *your* heat-treat problems. Call your local Electro-Alloys representative, or write for a copy of booklet T-225 "*Thermalloy Heat-Resistant Castings Give Longer Service Life.*" Electro-Alloys Division, 70410 Taylor St., Elyria, Ohio.

*Reg. U. S. Pat. Off.—designating not just one but a *group* of alloys —each developed to meet a specific heat and abrasion problem.

HEAT-RESISTANT CASTINGS • TRAYS • MUFFLES
RETORTS • CONVEYOR BELTS • RADIANT TUBES

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
Elyria, Ohio

Exhibitor	Booth No.
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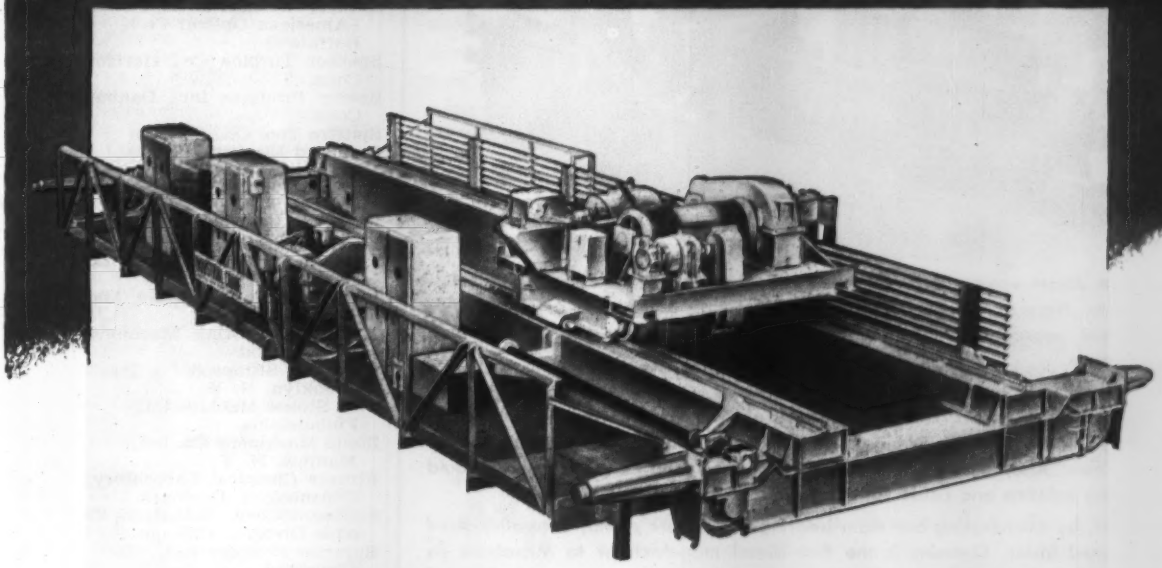
Peerless Electric Co., Warren, O.	706
Penton Publishing Co., Cleveland	1425
Perkins Machine Co., Warren, Mass.	2404
Phillips Mfg. Co., Chicago	1320
Phoenix Products Co., Milwaukee	2567
Picker X-Ray Corp., White Plains, N. Y.	2557
Pioneer-Central Division, Bendix Aviation Corp., Davenport, Iowa	2123
Plastic Metals Division, National-U. S. Radiator Corp., New York	2515
Pneuma-Serve Inc., Cleveland	1110
Portomag Inc., Ferndale, Mich.	2708
Precision Castings Co., Syracuse, N. Y.	1038
Precision Metal Molding, Cleveland	801
Precision Metalsmiths Inc., Cleveland	1830
Precision Scientific Co., Chicago	2568
Precision Shapes Inc., Suffern, N. Y.	510
Precision Steel Warehouse Inc., Chicago	2140
Precision Tube Co. Inc., North Wales, Pa.	2832
Pressco Casting & Mfg. Corp., Chesterton, Ind.	2615
Production Machine Co., Greenfield, Mass.	1809
Pyrometer Instrument Co. Inc., Bergenfield, N. J.	1037
Radiator Specialty Co., Charlotte, N. C.	2867
Ransburg Electro-Coating Corp., Indianapolis	1714
Ransohoff Inc., Hamilton, O.	2734
Raytheon Mfg. Co., Waltham, Mass.	2848
Reid-Avery Co., Baltimore	2861
Reliance Electric & Engineering Co., Cleveland	1130
Renite Co., Columbus, O.	1732
R. W. Renton & Co., Cleveland	2852
J. A. Richards Co., Kalamazoo, Mich.	1230
Riehle Testing Machines Division, American Machine & Metals Inc., East Moline, Ill.	241
Rochester Division, Consolidated Electrodynamics Corp., Rochester, N. Y.	1929
Rodgers Hydraulic Inc., Minneapolis	2722
Rotherm Engineering Co. Inc., Chicago	711
Jos. T. Ryerson & Son Inc., Chicago	405
S-P Mfg. Corp., Solon, O.	2850
Geo. Scherr Co. Inc., New York	710
A. Schrader's Son Division, Scoville Mfg. Co. Inc., Brooklyn, N. Y.	1812
Sciaky Bros. Inc., Chicago	2206
Scientific Electric Co., Garfield, N. J.	2502
Scott Paper Co., Chester, Pa.	703
Sealol Corp., Providence, R. I.	1505
Sentry Co., Foxboro, Mass.	1203
Service Diamond Tool Co., Ferndale, Mich.	1735
Sheffield Corp., Dayton, O.	455
Sheldon Machine Co. Inc., Chicago	1723
Shell Oil Co., New York	1316

Industrial STANDARD HEAVY DUTY CRANES are TODAY'S BEST VALUE



Standard Industrial Heavy Duty Crane Span 46'0", Capacity 10 tons with full magnetic control for heavy duty service in a foundry. Other models available in capacities up to 100 tons.

Practical design plus high quality modern components combine to make *Industrial* Heavy Duty Cranes today's best value. Ease of maintenance is designed into every section of this efficient crane. Safe accessibility to all working parts insures top performance with lowest cost. Consult with Industrial Crane and Hoist engineers for your next crane.

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INGERSOLL B-W BORG-WARNER

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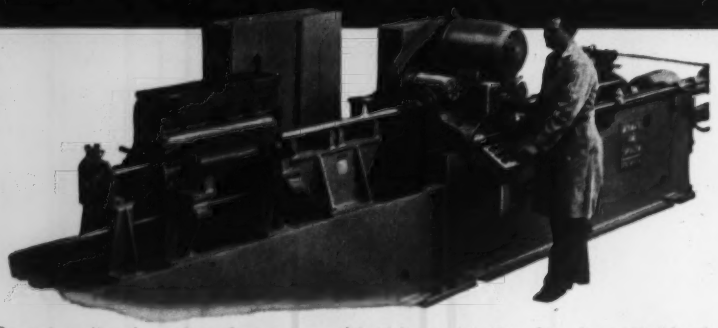
CHICAGO, ILLINOIS

HO 856 C

WHY CUMMINS main bearings are MICROHONED

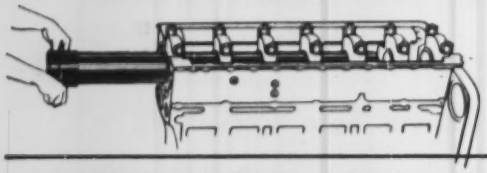


"Cummins diesel engines have a world-wide reputation for dependable, low-cost power. Here at Cummins, we attribute the wide acceptance of our engines to constant searching for better processing methods and improved engine performance.

"For example, if our crankshaft main bearings were undercut at the ends, tapered or out-of-round, then the full load of the journals would be borne by relatively small areas. This would cause bearing inserts to overheat and quickly break down. Also, should the bearings be misaligned, the crankshaft would flex during rotation and cause fatigue failure.

"However, by Microhoning our main bearings we secure *round, accurately-sized* and *aligned bores*. Cummins is the first diesel manufacturer to Microhone its main bearings. The surfaces of Microhoned bearings are clean-cut, free of deformed metal and the finish is consistent in every bore. In addition, the consistent accuracy generated by Microhoning permits us to make faster set-ups and use higher cutting feeds on preceding boring operations—Microhoning automatically corrects all inaccuracies.

"After Microhoning, all main bearing bores are checked with a gage plug 44 inches long and .0007 inch under required bore size. Gage must have a simultaneous slip-fit through all bores in the block. Tolerance for roundness is less than .0002 inch and finish is held to the specified 55 microinches."



Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.

☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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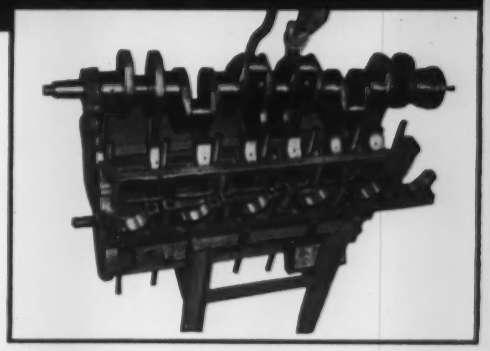
Sinclair Refining Co., New York	2646
Sintox Corp. of America, Allentown, Pa.	1823
Skil Corp., Chicago	2239
Skinner Chuck Co., New Britain, Conn.	2601
Socony Mobil Oil Co. Inc., New York	1840
Southco Division, South Chester Corp., Lester, Pa.	1017
Spee-Flo Co., Houston	2772
Special Libraries Association, Metals Division, Louisville	370
Spencer Scientific Instruments (American Optical Co.), Buffalo	1136
Spencer Turbine Co., Hartford, Conn.	2749
Sperry Products Inc., Danbury, Conn.	1428
Spitfire Tool Co., Chicago	2550
Standard Electric Tool Co., Cincinnati	1047
Standard Oil Co. (Ohio), Cleveland	2307
Standard Parts Co., Bedford, O.	2671
Stanley Electric Tool Division, Stanley Works, New Britain, Conn.	1741
L. S. Starrett Co., Athol, Mass.	919
STEEL, Cleveland	1425
Steel City Testing Machines Inc., Detroit	1324
Edwin B. Stimpson Co. Inc., Brooklyn, N. Y.	411
F. J. Stokes Machine Co., Philadelphia	1520
Stone Machinery Co. Inc., Manlius, N. Y.	2011
Struers Chemical Laboratory, Copenhagen, Denmark	815
Sunbeam Corp., Industrial Furnace Division, Chicago	942
Superior Foundry Inc., Cleveland	1207
Superior Pneumatic & Mfg. Inc., Cleveland	2819
Superior Tube Co., Norristown, Pa.	1220
Supreme Products Inc., Chicago	2721
Surface Combustion Corp., Toledo, O.	421
Swift Industrial Chemical Co., Canton, Conn.	836
Taylor Instrument Co., Rochester, N. Y.	2817
Technic Inc., Providence, R. I.	811
Tech-Pacific Corp., Newport Beach, Calif.	1730
Telenews Productions Inc., Cleveland	801
Tempil® Corp., New York	929
The Texas Co., New York	1602
Thomas Publishing Co., New York	2869
Thompson Electric Welder Co., Lynn, Mass.	1751
Thor Power Tool Co., Aurora, Ill.	2723
Arthur Tickle Engineering Works Inc., Brooklyn, N. Y.	2326
Timken Roller Bearing Co., Canton, O.	1051
Tinnerman Products Inc., Cleveland	1029
Titanium Alloy Mfg. Division, National Lead Co., New York	2111
Titanium Metals Corp. of America, New York	1241
Tocco Division, Ohio Crankshaft Co., Cleveland	2212
Torit Mfg. Co., St. Paul	935
Torsion Balance Co., Clifton, N. J.	1740

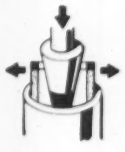
Exhibitor	Booth No.
H. O. Trerice Co., Detroit	816
Tubular Micrometer Co., St. James, Minn.	1009
Turco Products Inc., Los Angeles	2234
Uddeholm Co. of America Inc., New York	815
Union Mfg. Co., New Britain, Conn.	2629
United Shoe Machinery Corp., Boston	1835
U. S. Electrical Motors Inc., Los Angeles	2230
United States Gypsum Co., Chicago	830
United States Rubber Co., Coated Fabrics Department, Mishawaka, Ind.	2823
United Wire & Supply Corp., Providence, R. I.	554
Unitron Instrument Div., United Scientific Co., Boston	2661
Universal Castings Corp., Chicago	2754
Universal Tumbling Supply Co., Detroit	2570
Uniworld Research Corp. of America, Cleveland	809
Upton Electric Salt Bath Furnace Co., Roseville, Mich.	1509
Utica Drop Forge & Tool Corp., Utica, N. Y.	1221
Vaco Products Co., Chicago	2675
Vacu-Blast Co. Inc., Belmont, Calif.	2719
Vanadium Corp. of America, New York	343
Vandersee Corp., Union, N. J.	2408
Waldes Kohinoor Inc., Long Island City, N. Y.	2240
Wales-Strippit Corp., North Tonawanda, N. Y.	2405
Wallace Supplies Mfg. Co., Chicago	2401
Watson-Stillman Press Division, Farrel-Birmingham Co. Inc., Roselle, N. J.	2777
Waukee Engineering Co. Inc., Milwaukee	2508
Weatherhead Co., Ft. Wayne, Ind.	2029
Welding Illustrated, Cleveland	801
Wells Mfg. Co., Three Rivers, Mich.	1912
Western Reserve University, Cleveland	270
Westinghouse Electric Corp., Pittsburgh	1711
Weston Electrical Instrument Corp., Newark, N. J.	2737
Wheelabrator Corp., Mishawaka, Ind.	2580
Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill.	1829
S. B. Whistler & Sons Inc., Buffalo, N. Y.	2014
Wilson Mechanical Instrument Division, American Chain & Cable Co. Inc., Bridgeport, Conn.	1211
Wilton Tool Mfg. Co. Inc., Schiller Park, Ill.	808
Yale & Towne Mfg. Co., Powdered Metal Products Division, Franklin Park, Ill.	915
Zaco Laboratories Division, Phillips Products Co., Cleveland	1219
Zagar Tool Inc., Cleveland	2752
Carl Zeiss Inc., New York	2522

HOW MICROHONING generates round, accurate, aligned bearing bores



All types of cylindrical surfaces, including small diameters and combinations of soft and hard metals . . . interrupted by keyways, undercuts, ports, reliefs or cross holes . . . can be economically Microhoned to precision tolerances and alignment.

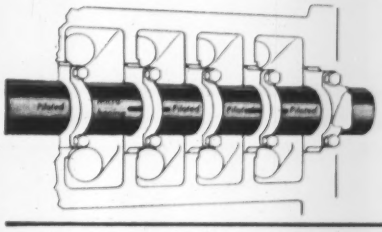
A typical example of Microhoning interrupted cylindrical surfaces is the Cummins Diesel Engine application. Here's how Microhoning generates accuracy and alignment in the crankshaft main bearing bores:



1. Cutting pressure is applied radially from the center of the Microhoning tool body. Abrasives and guides both are expanded by the same feed force, and wear at the same rate.

2. Abrading action is divorced from the effects of spindle or driveshaft vibration and misalignment by a universal joint that is between tool body and driveshaft.

3. The single bank of abrasives travels through all bores on every stroke. As abrasives are Microhoning one bore, the tool is piloted by the plastic guides in the other bores.



The principles and applications of Microhoning are thoroughly explained in a 16mm, 30-minute sound movie, "Progress in Precision". We'll be glad to reserve a print for your use.

☐ Please send me "Progress in Precision" in time for showing on _____ (date).

☐ Please send Microhoning literature; I am interested in the following application _____

NAME _____

TITLE _____

COMPANY _____

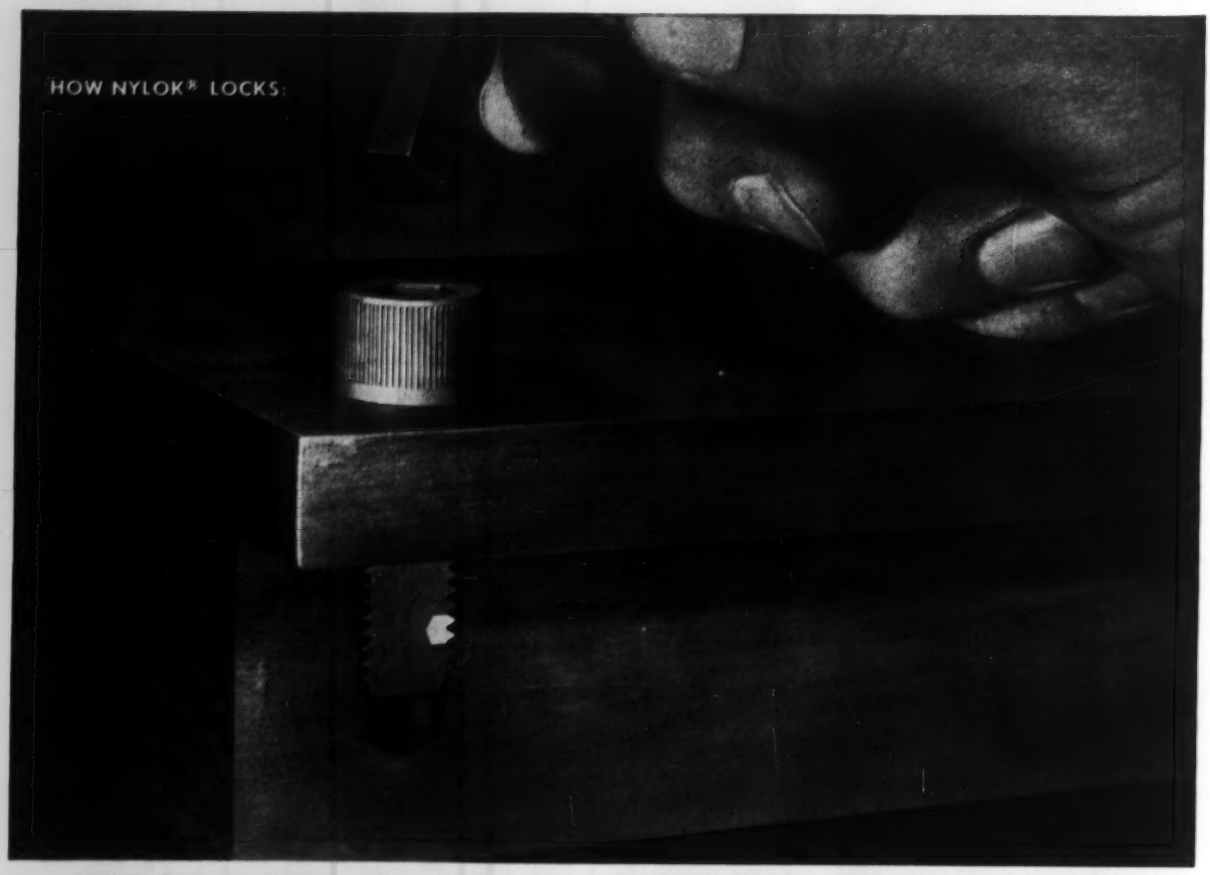
STREET _____

CITY _____ ZONE _____ STATE _____

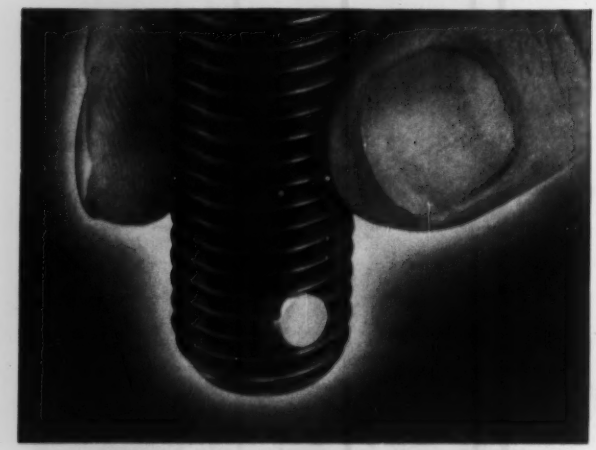
MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

NEW—a complete line of socket screw products



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.



BEFORE ASSEMBLY. The nylon pellet projects slightly beyond male threads. When assembled, female threads will be impressed into it. Pellet locks effectively whether the screw is seated or not.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

self-locking UNBRAKO that won't work loose

They simplify design and save production time

UNBRAKO socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

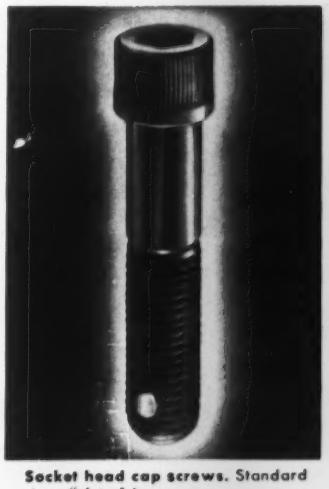
An UNBRAKO screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not shake loose.

You save production time when you build products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

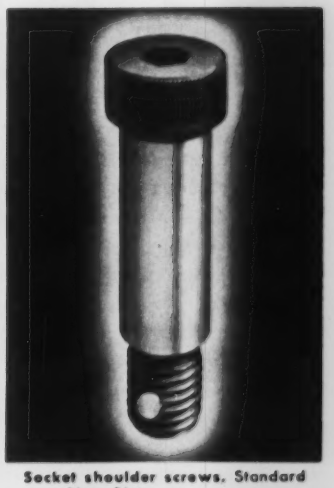
Self-locking UNBRAKOS are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 33, Pa.

**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

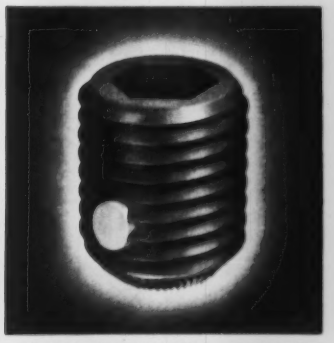


Socket head cap screws. Standard sizes # 6 to 1 in.



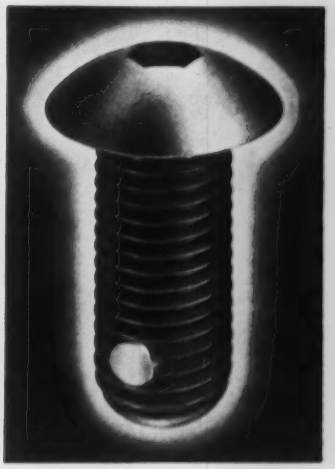
Socket shoulder screws. Standard sizes ¼ to ¾ in.

Socket pressure plugs. Standard sizes ⅛ to 1¼ in.



Socket set screws. All standard point types. Standard sizes # 6 to 1 in.

Flat head socket screws. Standard sizes # 6 to ¾ in.



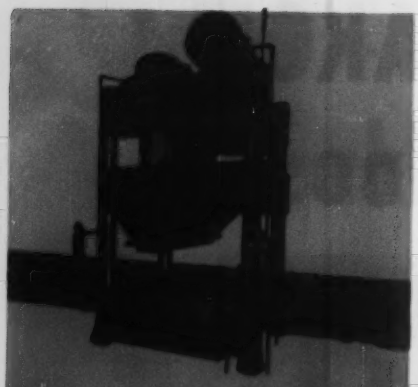
Button head socket screws. Standard sizes # 6 to ⅜ in.

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

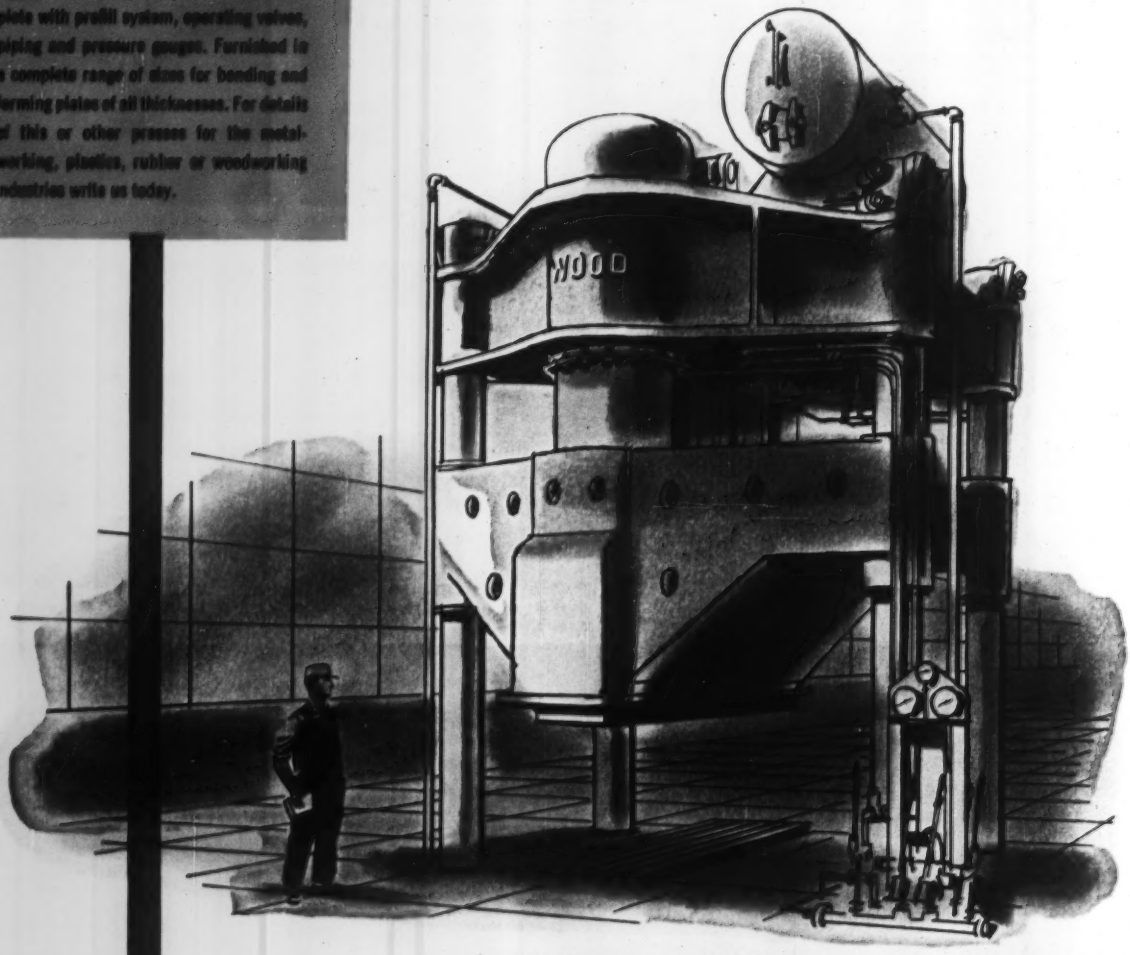
JENKINTOWN PENNSYLVANIA



1500-ton Heavy-Duty Forming Press for bending and forming operations on heavy steel plate. Moving platen can be tilted right or left during stroke. Furnished complete with prefill system, operating valves, piping and pressure gauges. Furnished in a complete range of sizes for bending and forming plates of all thicknesses. For details of this or other presses for the metal-working, plastics, rubber or woodworking industries write us today.

You'll like what it does to production

It's just plain common sense—when your down-time decreases your production is bound to increase. Down-time can't be eliminated, but R. D. Wood presses hold it to a minimum. The meticulous design, choice materials and careful craftsmanship that go into a Wood press produce a superior product—a dependable, smooth-working press that can't help but increase production records. Products with the Wood stamp of quality have been piling up production records for more than 150 years.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

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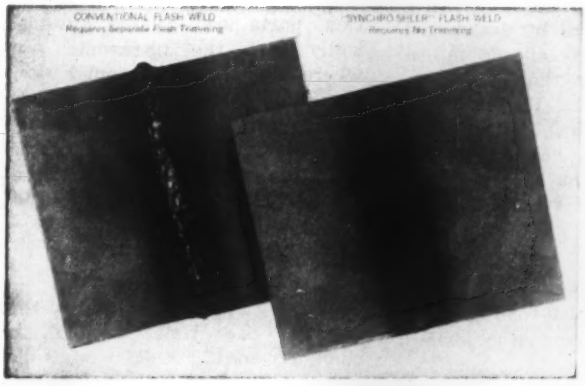
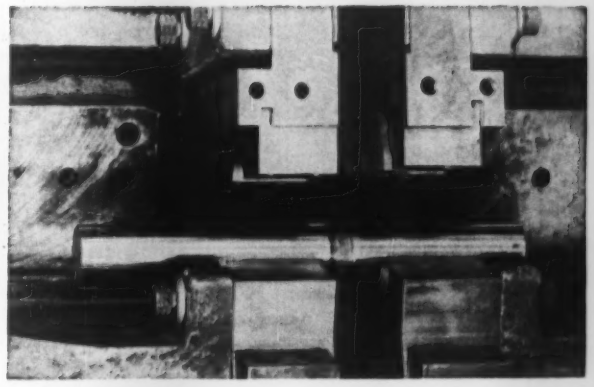
MAKERS OF HYDRAULIC PRESSES AND VALVES • FIRE HYDRANTS • CAST-IRON PIPE • GATE VALVES • GAS PRODUCERS • ACCUMULATORS

On Display at the Show





Flash Welder Eliminates Trimming, Cuts Costs

Synchro-Shear is a precision, automatic resistance welder that trims the flash as it welds.

The machine will weld mild carbon steel, 1.00 per cent carbon steel, high speed steel, high alloy steel and stainless steel.

It welds and trims all shapes normally encountered in flash welding, including flats, squares, rectangles, rounds and most irregular or extruded shapes.

The welded product is ready for use; in most cases no postweld cleanup is needed.

When a highly finished product is desired, the weld area requires only the same treatment as the rest of the part.

The shearing action is an integral part of the welding cycle and immediately follows the upset motion. There is no appreciable difference in production rates, compared with conventional flash welding.

All the work handling, labor and equipment expense of separate flash trimming are eliminated.

The welders are available in a complete range of sizes. *Write*: Thomson Electric Welder Co., Lynn, Mass. *Phone*: Lynn 2-7710 (Metal Show Booth 1751)

Spray Coatings Protect Against High Temperatures

Rokide spray coatings can be applied to a variety of materials to protect them against the effects of high temperature, abrasion, erosion and corrosion.

Important uses are in the fields of rockets and jet propulsion.

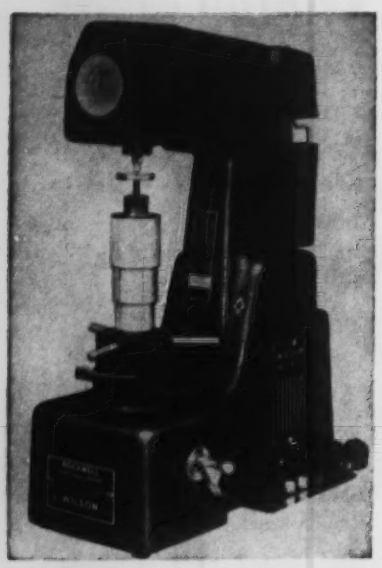
Boron carbide products—sandblast nozzle liners, dressing sticks for grinding wheels, loose grain for lapping and polishing, and wear resistant parts—also will be exhibited.

Other exhibits will be on ceramic cutting tools and silicon carbide products for nonabrasive uses. *Write*: Norton Co., Worcester 6, Mass. *Phone*: Pleasant 2-4641 (Metal Show Booth 2414)

NEW PRODUCTS and equipment

Hardness Tester

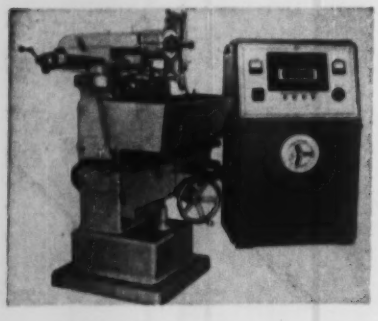
Model Y is a semiautomatic, high capacity Rockwell hardness tester. Its short test cycle makes it possible to increase the number of readings taken.



The hardness indicator pointer automatically returns to zero when a minor load is applied. *Write*: Wilson Mechanical Instrument Division, American Chain & Cable Co. Inc., 929 Connecticut Ave., Bridgeport 2, Conn. *Phone*: Edison 5-0161 (Metal Show Booth 1211)

Electronic Erosion

This machine reproduces a cavity in carbide or hard alloys that has the shape and profile of a soft master tool. The tool acts as an electrode; it uses a spark to cut a form accurate to within ±0.0015 in. Surface finish can be as fine as 10 microinches.



The electrode is advanced as machining progresses and is held at a preset distance (0.0015 to 0.015 in.) from the work.

A job can be set on the machine and left unattended. When it is completed, the tool is retracted and the machine stops. *Write*: Abaco Industries Inc., 78-21 Queens Blvd., Elmhurst, N. Y. *Phone*: Newtown 9-1400 (Metal Show Booth 2434)

Automated Assembly

Appliances, automotive components, metal furniture and other parts are assembled by automated fastener feeding at speeds up to four times faster than the best alternative methods. *Write*: Pneuma-Serve Inc., P.O. Box 1025, Cleveland 2, O. *Phone*: Edison 1-3341 (Metal Show Booth 1110)

Bearings

These nonmagnetic antifriction bearings are designed for high temperature and corrosion resistant service.

Also on display: Sets of precision stainless steel tooling balls used as reference points in jig and fixture work and a complete range of Teflon balls for uses requiring

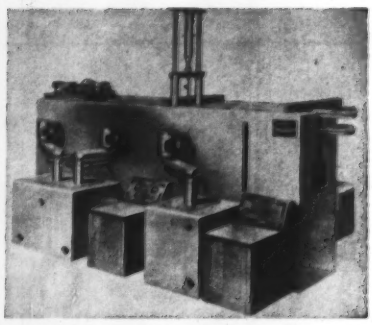
resistance to severe caustics and acids. *Write*: Industrial Tectonics Inc., 3684 Jackson Rd., Ann Arbor, Mich. *Phone*: Normandy 3-2451 (Metal Show Booth 2517)

Ultrasonic Cleaning

Blind holes and difficult recesses of castings, engine parts, stampings, valve bodies and other parts are cleaned with this machine.

It combines a single ultrasonic cleaning stage with conventional wash, rinse and dry sections.

Parts are carried through the machine on an automatic indexing double Monorail conveyor. The



cycle: Washing, rinsing, ultrasonic cleaning, rinsing, hot air drying.

In the ultrasonic cleaning section, parts are lowered automatically into the ultrasonic tank where high-frequency sound waves break contamination loose from metal parts. *Write*: Ransohoff Inc., N. Fifth St. & Ford Blvd., Hamilton 40, O. *Phone*: Twinbrook 3-5813 (Metal Show Booth 2734)

Oxygen Cylinder

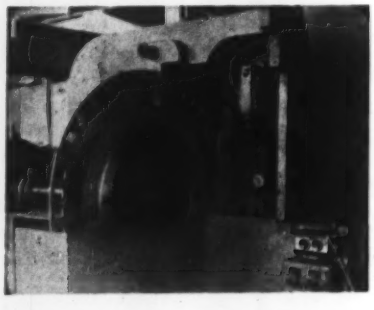
The LC-3 is a space saver that reduces the time needed for change-overs. This 3000 cu ft liquid oxygen cylinder lasts more than 12 times longer than large-size conventional types. They require only one-third as much space as their high-pressure equivalents.

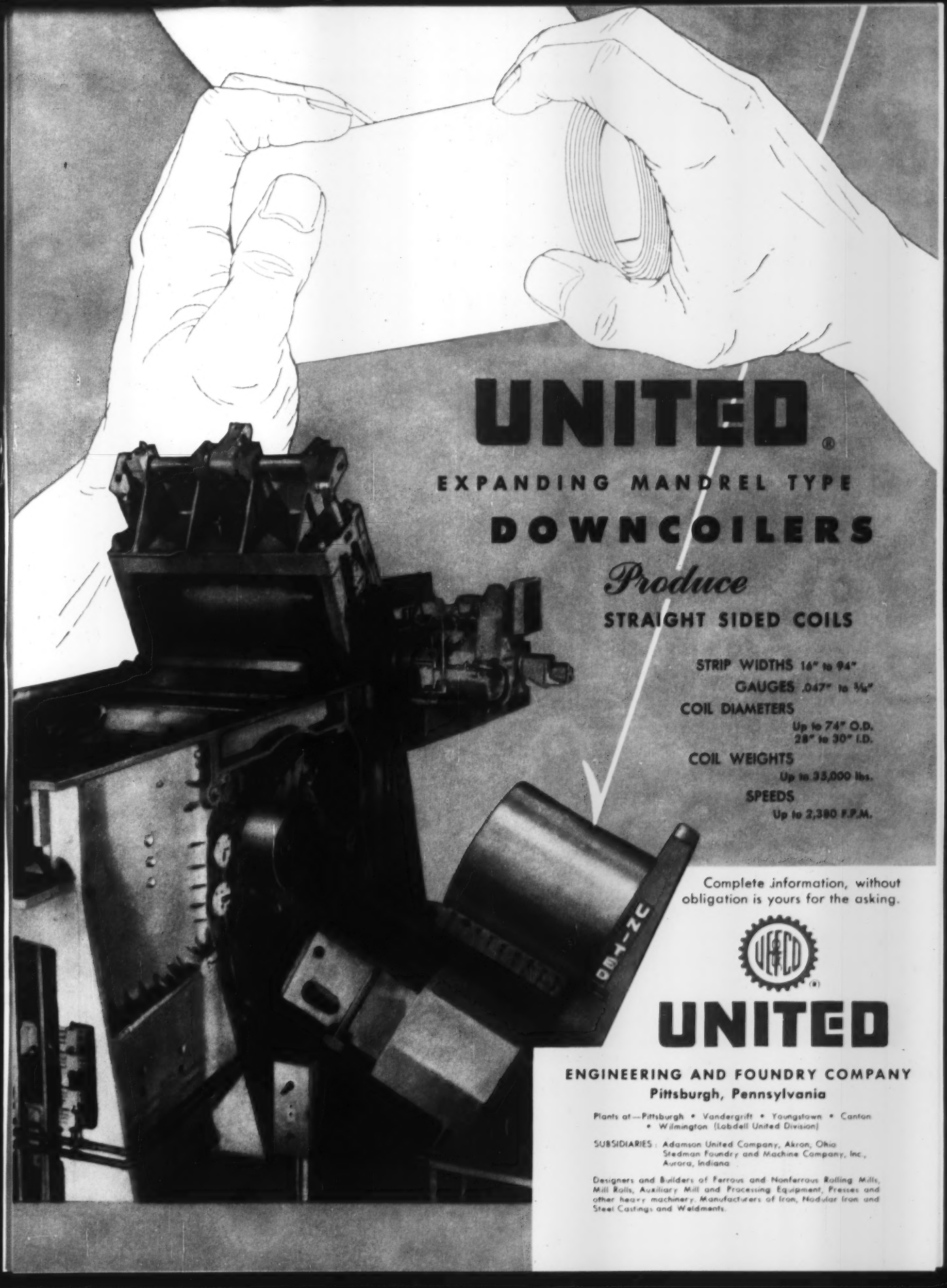
Weight of a full cylinder is 505 lb. It will deliver 300 cu ft of oxygen an hour at 75 psi. *Write*: Linde Air Products Co., division of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y. *Phone*: Murray Hill 6-5100 (Metal Show Booth 1608)

Surfacing Machine

Two operations are done in a single pass by this machine. It uses twin abrasive belts as the cutting media. Each belt is backed by a hard or cushioned platen.

The machine may be used for a wide variety of applications where





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EXPANDING MANDREL TYPE

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STRAIGHT SIDED COILS

STRIP WIDTHS 16" to 94"

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COIL DIAMETERS
Up to 74" O.D.
28" to 30" I.D.

COIL WEIGHTS
Up to 33,000 lbs.

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Pittsburgh, Pennsylvania

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Stedman Foundry and Machine Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

Inspector checks shipment of Johnson bushings at Miller plant. Rejection rate is almost nil, despite tolerances as close as .0005".

Assemblyman slips Johnson bushing on shaft of Miller Fluid Power cylinder. Note the convenient packaging of the bushings.

Johnson Helps Miller Fluid Power Provide Leakproof Seals At 3000 PSI

Miller Fluid Power Division, Flick-Ready Corp. has been highly successful in designing and building hydraulic cylinders which are leakproof over a range of pressures from four to 3000 psi. Founded in 1903 as a maker of marine engines and custom machinery, Miller started making hydraulic cylinders immediately after the last war. During the intervening ten years Miller's growth has been phenomenal.

Contributing to the high quality of the Miller cylinders are Johnson bushings which are made to Miller specifications. "The consistent delivery of high quality, exceedingly low rejection rate Johnson bushings is especially important to an expanding firm like ours," says Mr. L. J. White, Assistant Purchasing Agent. "The Johnson achievement is tremendous when you consider that our production rates are growing constantly, and that we require aircraft tolerances on six very critical dimensions. We have been very well satisfied with Johnson's ability to meet Miller's rigid specifications."

The Johnson Bronze Company would be glad to work with any manufacturer in the design and production of special bushings and bearings. The superior type of service given Miller Fluid Power is the standard of Johnson performance. If you have a bearing problem, we can provide the solution. We have over 2000 stock items and facilities for producing any custom design. For complete information on our standard products and the services offered by our Product Engineering Dept., write Johnson Bronze Company, 550 S. Mill Street, New Castle, Pa.

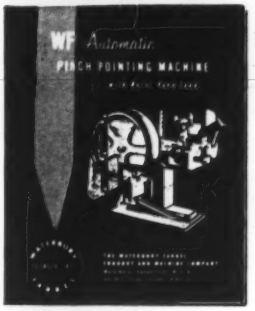
Johnson Bearings

LEDALOYL (powder metallurgy) • ALUMINUM ON STEEL • BRONZE ON STEEL • STEEL AND BABBITT • CAST BRONZE

☐ **"Waterbury" Automatic Nut Formers**

Cir. No. 930-A-2

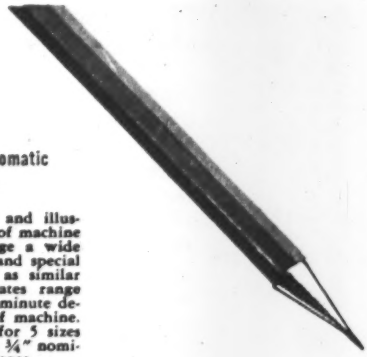
Describes operation and illustrates design details of machine which can cold forge a wide variety of standard and special nut blanks as well as similar parts. Production rates range from 60 to 125 per minute depending upon size of machine. Gives specifications for 5 sizes ranging from ¼" to ¾" nominal bolt capacity. 8 pages.



☐ **Automatic Pinch Pointing Machine**

Cir. No. 742-A-2

Describes and illustrates rotor vane feed pinch pointer with maximum production capacity of 150 per minute. Max. blank diameter ¼". Max. length under head 2½". Min. length under head ¼". Shows typical work samples and gives table of specifications.



☐ **High Speed Screw Slotter**

Bul. No. 106-A-3

Describes and illustrates WF's revolutionary new slotter—production team-mate of the new threader. Uses single feed mechanism and single saw to slot up to 2,000 burr-free blanks per minute.

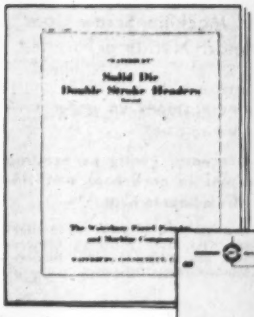
☐ **High Speed Threader**

Cir. No. 942-A

Describes and illustrates completely new type of thread rolling machine which uses planetary dies to thread up to 2,000 blanks per minute.

ARE YOU UP-TO-DATE ON WF BOLT, NUT & SCREW MACHINERY?

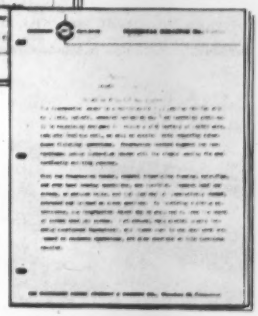
Send For Your FREE Copy Of These NEW Bulletins



☐ **"Waterbury" Solid Die, Double Stroke Headers**

Cir. No. 933-A-2

Explains construction and operating features of crank type, two blow headers for producing the standard varieties of bolt and screw blanks as well as many special cold-forged products. Gives specifications for five sizes of long stroke and five sizes of short stroke machines handling wire diameters from 3/16" to ½". 8 pages.



☐ **"Waterbury" Progressive Headers**

Bul. No. 104-A-2

Covers features of multiple die cold heading machine which has roll feed, cut-off, transfer mechanism and four operating stations. Points out that machine can produce wide variety of headed work including hexagon head cap screw blanks and socket head cap screw blanks. Four sizes of headers are covered in the specification tables. 8 pages.

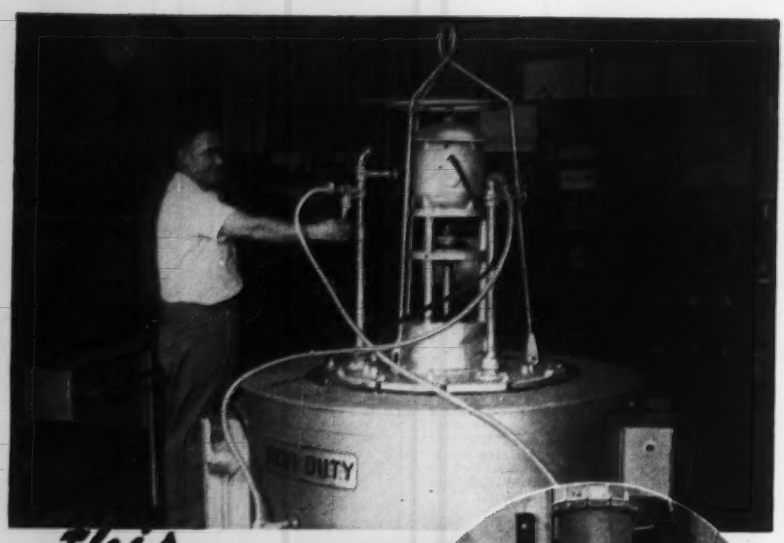
Write for circulars by number or check the ones you want and simply mail this page with your name and address to—

WATERBURY FARREL FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut

Offices: Chicago, Cleveland, Millburn, N. J.

Waterbury Farrel

WF-22



this

HEVI DUTY

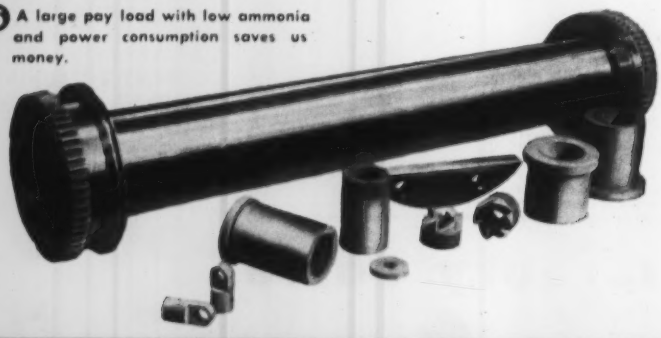
Nitriding Furnace

GIVES US WHAT WE WANT...

Paul C. Farren, Chief Metallurgist at Hartford Machine Screw Company, says, "I like this Hevi Duty Vertical Retort Nitriding Furnace because

1. We can nitride all types of steel including stainless.
2. This Hevi Duty Furnace is adaptable to the Floe process of Nitriding.
3. We get uniformity throughout the entire load.
4. The parts come out clean and treated to very close tolerances.
5. A large pay load with low ammonia and power consumption saves us money.
6. This furnace stands up under continuous use.
7. Control is easy, giving us exacting case depths in each heat and uniformity from heat to heat."

These and the many other advantages built into Hevi Duty Nitriding Furnaces can benefit you. Write for more information today — Bulletin HD-646-R.



HEVI DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers *Constant Current Regulators*

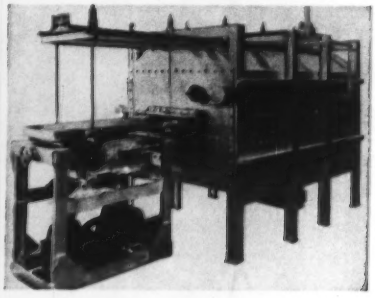
opposite sides of the part require a grinding or finishing operation. Different types of work feeding devices and conveyors may be attached to suit a wide variety of sizes and shapes.

Belt speeds of 3500 sfpm are developed by 7½-hp motors. *Write*: Production Machine Co., Greenfield, Mass. *Phone*: Prescott 3-3634 (Metal Show Booth 1809)

Furnaces

This snap hearth furnace uses a protective atmosphere.

Also on display will be equipment for heating metals from ingot



to finished product. *Write*: Surface Combustion Corp., Toledo 1, O. *Phone*: Jordan 4611 (Metal Show Booth 421)

Stud Welding

Large diameter studs (1 in. and up) can be end welded with a production unit using an NS-9 stud welding gun and a 2000-ampere welding generator.

Stud welding eliminates the leakage problem in tank manufacture

because no holes need be punched or tapped to receive threaded bolts. *Write*: Nelson Stud Welding Division, Gregory Industries Inc., Lorain, O. *Phone*: 56-931 (Metal Show Booth 1930)

Drill Press

This 15-in. drill press has six different spindle adapters which are taper mounted for accuracy. They are firmly locked on the spindle with a threaded collar.

The drill, with the adapters, does counterboring, tapping, surface grinding, routing, mortising, plug cutting and wood shaping.

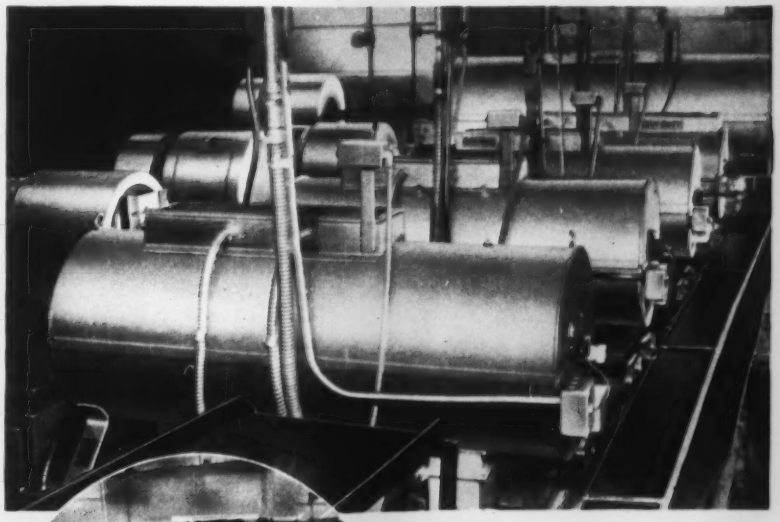
Slow (470 rpm) and high speed (4600 rpm) models are available. Spindle travel is 4 5/16-in.

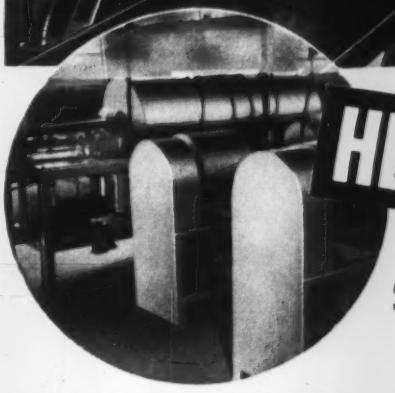
A 12 x 18 in. tilting table has a convenient tilt angle scale, side clamping edges and machined front surfaces drilled for mounting of work or fixtures. *Write*: Delta Power Tool Division, Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. *Phone*: Churchill 1-8400 (Metal Show Booth 1916)

Steel Plate

E-Z-Cut steel plate is especially suited for making die bases, jigs, molds and other products which need considerable machining.

The fast cutting possible with





HEVI DUTY

SHAKER HEARTH FURNACES

are saving MONEY...TIME...MATERIAL...

Oregon Saw Chain Corporation, the world's largest producer of top quality saw chain, uses five Hevi Duty Shaker Hearth Furnaces to harden saw teeth. They say, "We have solved a heat treating problem and have paid for the furnaces from the savings."

MONEY

The low cost, economical operation of the continuous production type Shaker Hearth Furnace has cut heat treating costs in half. Little maintenance means additional savings.

TIME

Now one man treats more than a ton of small parts every eight hours. Less handling of the parts is required with a steady flow to the production lines.

MATERIAL

The Hevi Duty Shaker Hearth Furnace treats each part individually. They pass through the furnace in a natural gas atmosphere and fall directly into the quench. This method hardens the saw teeth to 63-65 Rockwell with no rejects due to distortion and scale.

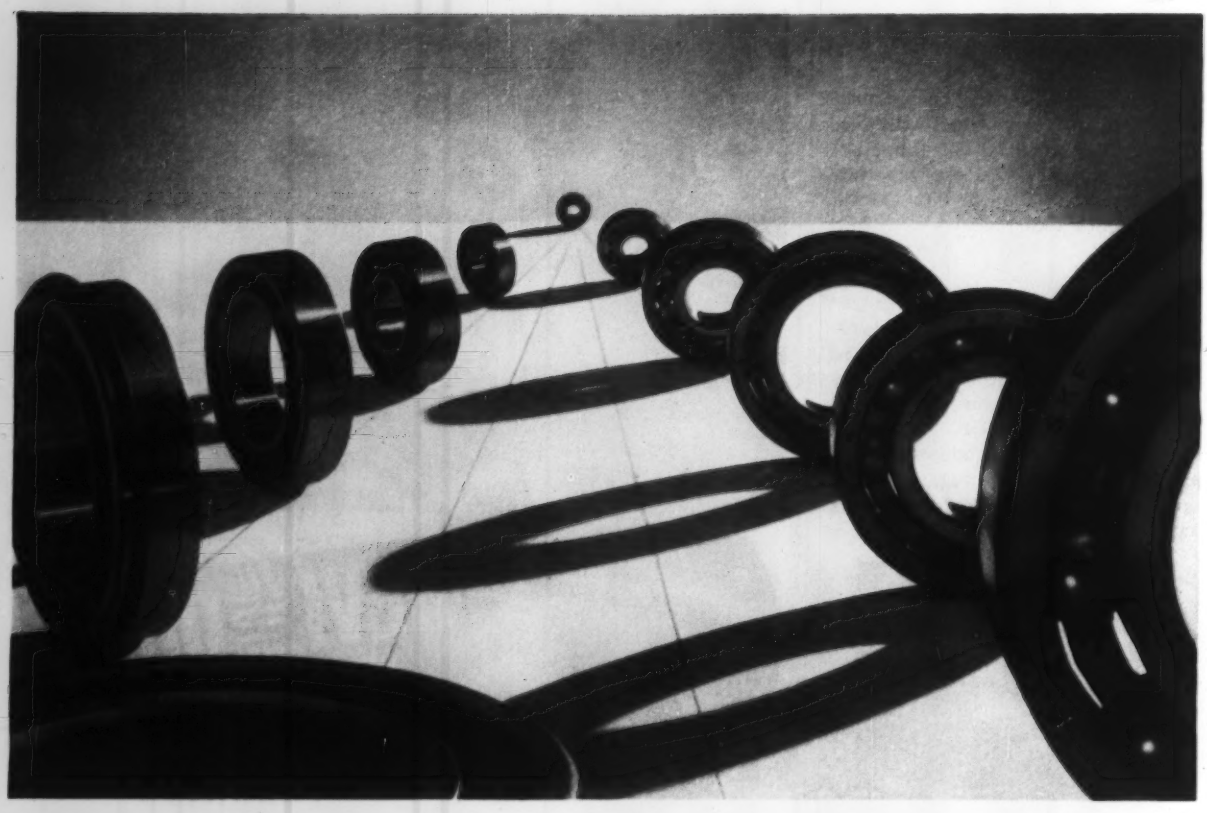
For more information about this modern production tool, write for Bulletin 850.

HEVI DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers *Constant Current Regulators*



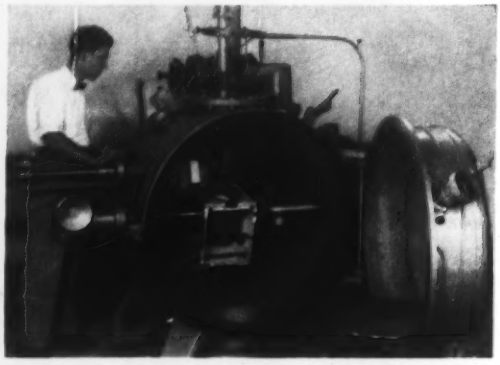
Will Vacuum Melted Metals do for YOUR Product what they do for Ball Bearings?

A Vacuum Furnace will help you get the Answer

Vacuum melted steels are consistently free of inclusions and exceptionally clean. As a result they provide for ball bearings:

1. Bearing life consistently 100% to 200% better than handbook ratings for normal temperature operations.
2. Bearing life consistently up to 600% longer for high temperature, high speed applications.
3. Up to 90% reduction in bearing race rejects.

Would metals with such characteristics make *your* product better? A vacuum furnace will enable you to develop materials especially suited to your needs. We have made and operated more high vacuum furnaces than any other manufacturer in the world. Can we help you, too? Send coupon below today.



NRC Model 2555 Vacuum Furnaces are now being used by aircraft companies, engine manufacturers, investment casters, specialty steel producers to speed up development of new materials that will meet ever more severe operating requirements.

See us in Booth 2108 METAL SHOW Cleveland October 8-12

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Dept. 1210, Charlemont St., Newton Highlands 61, Massachusetts
Send me Data Sheet on NRC Vacuum Furnace 2555 ☐
NRC Vacuum Furnace Bulletin ☐ Have your representative call ☐

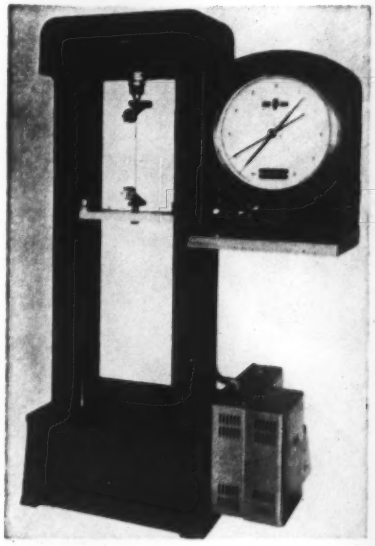
Name.....Title.....
Company.....
Address.....
City.....Zone.....State.....

this leaded steel is illustrated by mechanized flame cutting of plain and irregular shapes using an electronic eye tracer. *Write*: Joseph T. Ryerson & Son Inc., Box 8000-A, Chicago 80, Ill. *Phone*: Rockwell 2-2121 (Metal Show Booth 405)

Testing Machine

The Lo-Cap Electronatic line of testing machines has capacities up to 1000 lb.

The machines are available as tension, compression, flexure or universal units.



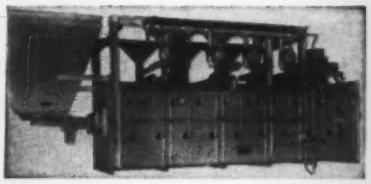
A single range of infinitely variable speed is positive under load as well as under no load. *Write*: Tinius Olsen Testing Machine Co., Willow Grove, Pa. *Phone*: Osborn 5-7100 (Metal Show Booth 1137)

Heat Treating

The series 240 reciprocating furnace features a stationary muffle with a moving hearth, positive atmosphere control and simplified hearth operating mechanism.

The furnace can heat treat 450 lb an hour and discharge it into automatic quenching, washing and tempering equipment.

Clean hardening, light case carburizing, etc., can be done without any changes in the furnace.



Continuous flow assures that each workpiece receives an individual heat treatment, quench, wash and temper. *Write*: American Gas Furnace Co., Elizabeth B, N. J. *Phone*: Westfield 2-0017 (Metal Show Booth 2841)

Spectrometer

From the sparking of a single sample, the Quantovas makes a rapid spectrochemical analysis of the carbon, phosphorous, sulphur, silicon and manganese in steel.

Analyses of the five elements are permanently recorded on paper. A duplicate analysis can be made in 2 minutes.

A mechanical pump creates the needed vacuum. The instrument also can be used to analyze the

HANSEN

SERIES RL

QUICK-CONNECTIVE

RING-LOCK COUPLINGS

HANSEN SERIES RL EFFECTIVELY HANDLES MORE VOLUME THAN ANY OTHER COUPLING OF EQUAL DIMENSIONS

Hansen Series RL One-Way Shut-Off Couplings will handle any job in your shop using ¼" to ⅛" connections—from the air line to the air tool. All Hansen Series 2-RL Sockets and Plugs are interchangeable with each other. Likewise all Sockets and Plugs of the slightly larger, greater capacity Series 3-RL are similarly interchangeable with each other.

Consequently, by standardizing on either Hansen Series 2-RL or Series 3-RL Couplings, you eliminate any need for various size couplings in your hook-up—make it easy to keep stock of parts in balance—and hold inventories to a minimum.

Locking ring provides positive lock and assures tight fit. Equipped with automatic sleeve lock.

HANSEN SERIES RL HANDLES ANY JOB WITH FITTINGS FROM ¼" to ⅛", FROM THE AIR LINE TO THE AIR TOOL

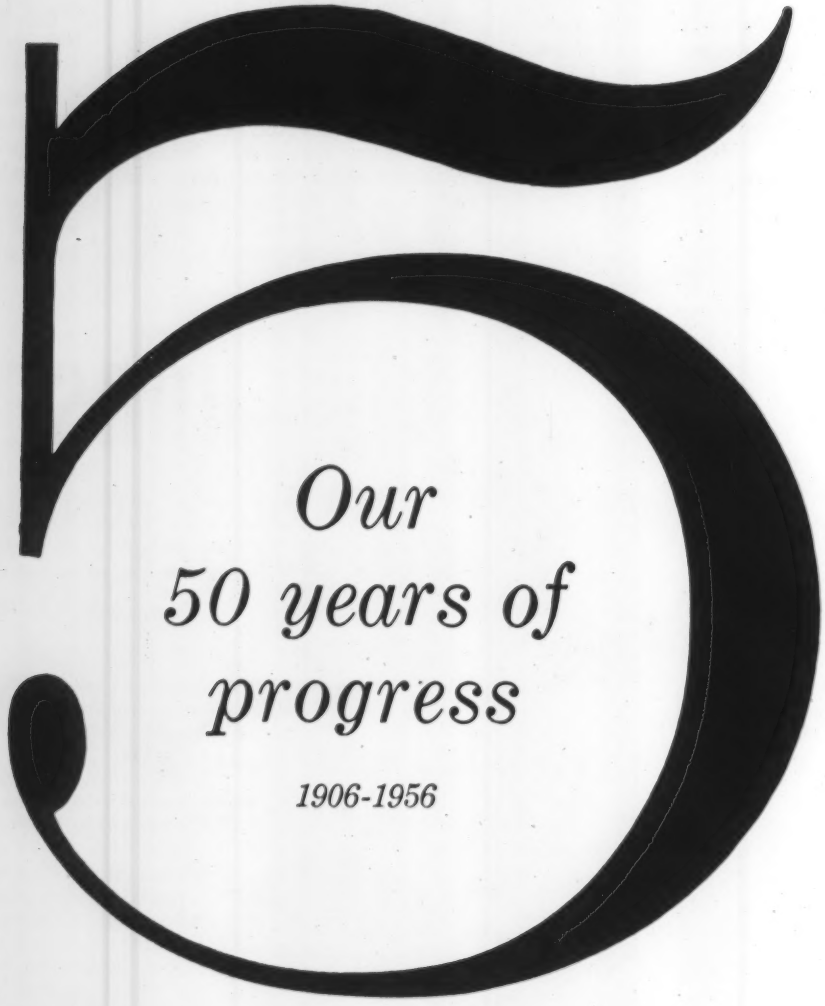
Two-Way Shut-Off and Straight-Through Couplings also available.

WRITE FOR CATALOG

SINCE 1915 — QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO



From one mine . . . one plant . . . and a few Vanadium products, Vanadium Corporation of America now produces over 90 products of Chromium, Silicon, Manganese, Titanium, Vanadium and Aluminum. These include ferro-alloys, metals and chemicals.

We are proud of our growth and our contributions to the Metals Industry. But fifty years of progress is just a beginning, a foundation for better things to come.

To improve our service to customers, we have . . . expanded our integrated system of mining operations . . . enlarged and modernized our milling operations . . . built two new smelting plants; one at Graham, West Virginia, and another at Cambridge, Ohio, to augment production of our Niagara Falls, New York plant . . . started construction of a fourth plant in Jefferson County, Ohio . . . built a research Center at Cambridge, Ohio . . . and recently added a new Pilot Plant.

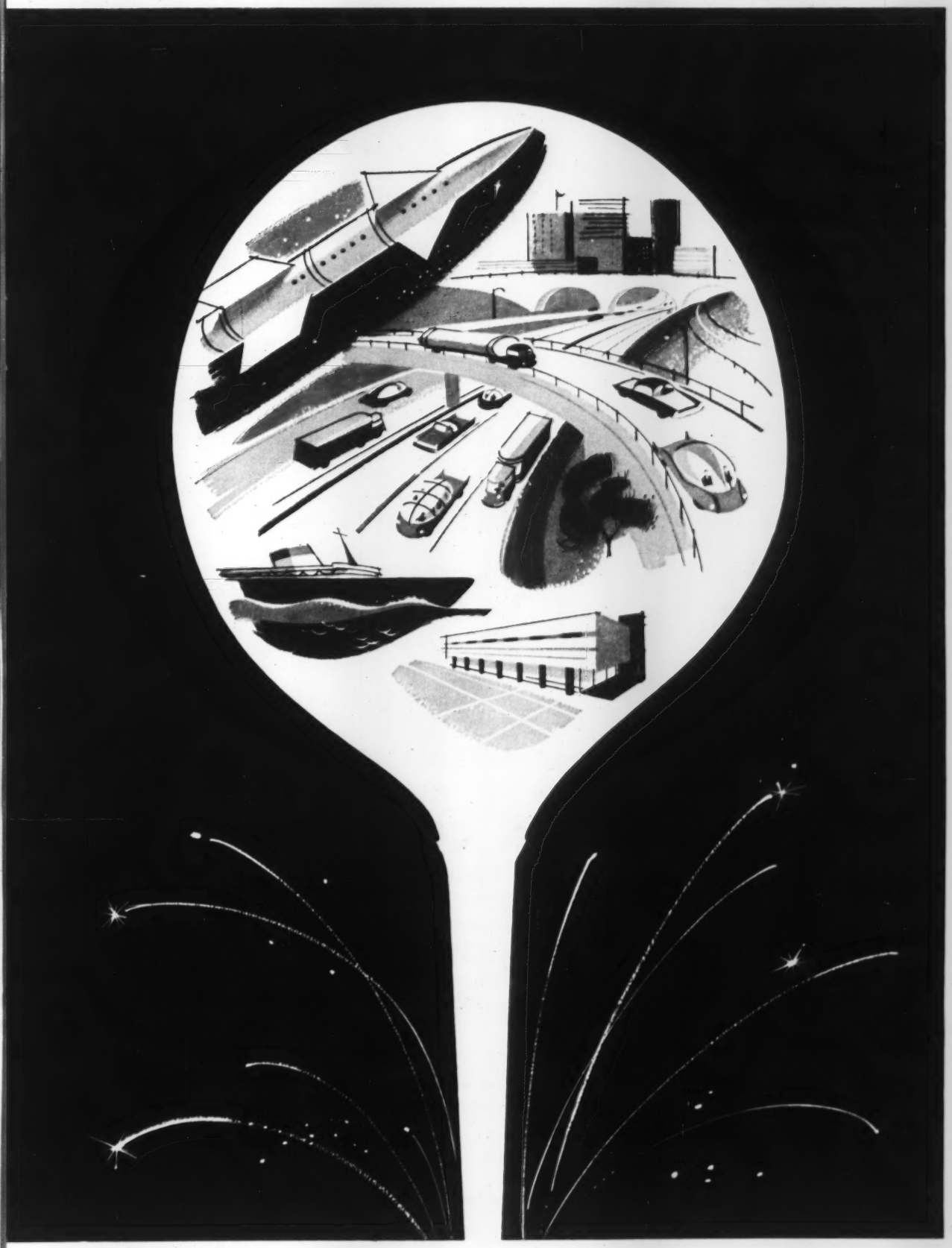
All this as a foundation on which we will continue to build an increasingly efficient service for you.

To see 50 Years of Progress—Be sure to visit Vancoram Booth #343 at the Metals Show, Cleveland, Oct. 8-12.

VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y. • Pittsburgh • Chicago • Detroit • Cleveland

Producers of alloys, metals and chemicals



hydrogen, nitrogen and oxygen in metals.

Also on exhibit: An x-ray fluorescence instrument that continuously determines the thickness of a metal coating to a millionth of an inch.

This instrument makes nondestructive analysis for a single element (metal, powders or liquids) directly on the production line.

It can handle the continuous analysis of most elements with an atomic number over 20 — metal strip, ores, tailing, slags, cements, glasses, pigments, etc. *Write*: Applied Research Laboratories, P.O. Box 1710, Glendale 5, Calif. *Phone*: Churchill 9-6193 (Metal Show Booth 2112)

Hardness Tester

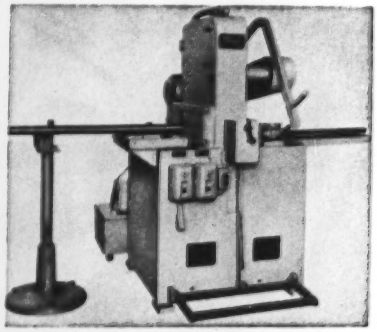
This microhardness tester is combined with a metallurgical microscope. A nondestructive test can be made on a land width of 0.002 in. in less than a minute. Range of the indenter load: 25 to 1000 grams.

When used as a microscope, interchangeable objective lenses provide magnifications of 200 and 400 power. *Write*: Sheffield Corp., Dayton 1, O. *Phone*: Kenmore 3131 (Metal Show Booth 455)

Abrasive Cutting

Model 64 is a wet abrasive machine that uses oscillating action to speed the cutting of medium size bar stock.

It will handle sheets, angles, channels, pipes, tubes and solids of practically any analysis. A square inch of material can be cut in about 4 seconds. Capacities are: Solids, 3 in. in diameter; tubing, 4 in. in diameter; and 1 x 6 in. steel plate.



Also on display are aluminum oxide cutting wheels for steel and most other metals and alloys. *Write*: Campbell Machine Division or Allison Division, American Chain & Cable Co. Inc., 929 Connecticut Ave., Bridgeport, Conn. *Phone*: Edison 5-0161 (Metal Show Booth 1816)

Vacuum Furnace

Model 2551 is a 20-kw induction furnace that will melt 12 lb of steel in less than 20 minutes. Top temperature using a standard magnesia crucible is nearly 3100°F.

Coaxial leads bring power and water to the crucible coil assembly.

A high capacity pumping assembly produces pressures down to 0.5 micron. A 6-in. sight port has a shield and wiper to remove contamination when accurate pyrometer measurements are made.

Optional assemblies are available for sintering, annealing and out-

CRANEMASTERS

. . . fill the bill for

CONTINENTAL CAN CO.

This 10-ton cab-operated *Cranemaster* is the first of two in service for Continental Can Co. Like so many other manufacturers, Continental Can Co. found Cranemasters *the top initial value* . . . with lasting satisfaction assured by Abell-Howe's years of experience in building overhead handling equipment that better *fills the bill* for industry of all kinds.

CAPACITIES TO 15 TONS —SPANS TO 60 FT.

CRANEMASTERS
FOR BETTER CONTROL OF COSTS!

First, you save on Abell-Howe low engineering and production costs! Then you save on operating costs because of *Cranemaster* speed and dependability... and the precise control you need for the most demanding lifting-loading jobs.

Send For Bulletin C-110

7747 Van Buren Street ABELL-HOWE COMPANY Forest Park, Illinois

B-RIGHT-ON®

SOCKET SCREW PRODUCTS

always measure up!

QUALITY B-RIGHT-ON® PRODUCTS

Socket screw users who want *what* they want *when* they want it know it pays to specify B-RIGHT-ON! Brighton Socket Screw Products *always* measure up.

Standard or special, Brighton Screws must meet and pass factory standards that are higher even than those specified by the ultimate user of the screws. Rigid control, from initial steel selection to final packaging, certifies every screw as B-RIGHT-ON quality.

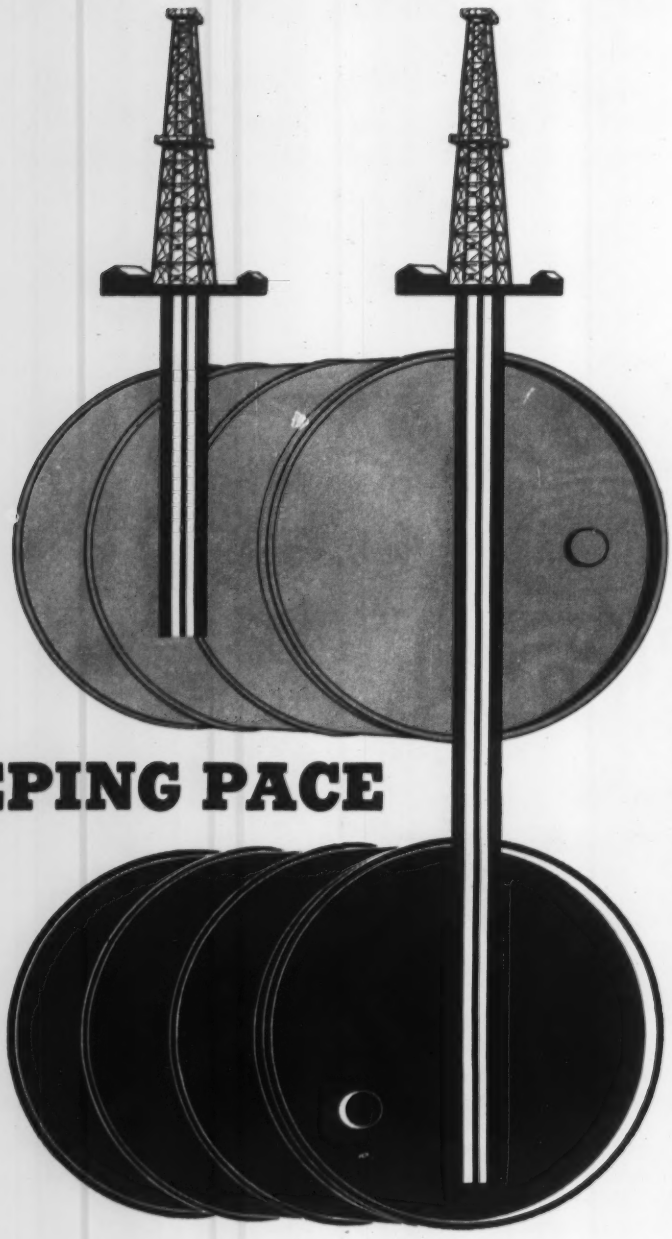
Selected mill supply houses, Brighton distributors, complete the control chain, assure the user of service and delivery as dependable as the screws . . . B-RIGHT-ON service.

Write for descriptive literature . . . see how

YOU CAN DO BETTER WITH B-RIGHT-ON.

THE BRIGHTON SCREW & MANUFACTURING CO.

1835 READING ROAD CINCINNATI 2, OHIO



KEEPING PACE

Drills were chewing their way down for about 2000 feet in the search for oil in 1916. Today's drilling depth is more than double that.

The change in drilling that forty years has brought well symbolizes many advances in the petroleum and chemical industries. Engineers have dug more deeply into the secrets of nature, too . . . have designed plants and processes to wrest new products and services from petroleum, ores and elements.

We mentioned 1916 because that is the year Sun Ship was founded. It has long served the swift-growing needs of petroleum and chemical industries. Year by year, the engineering skill and facilities of the great Sun Ship plant have proven their ability to meet the demands for plant and equipment keyed to the swift pace of progress in these and other important fields. Sun Ship keeps pace with progress.

•

Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

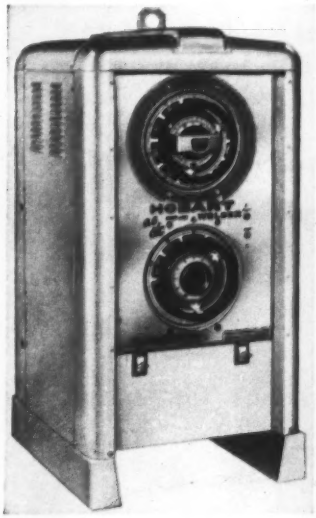
ON THE DELAWARE • CHESTER, PA.

gassing. *Write*: NRC Equipment Corp., a subsidiary of National Research Corp., 160 Charlemont St., Newton Highlands 61, Mass. *Phone*: Decatur 2-5800 (Metal Show Booth 2108)

Arc Welder

This ac-dc inert gas arc welder has a rating of 200 amperes at 40 volts. Current range: 10 to 300 amperes, ac or dc.

A selector switch permits the operator to choose alternating current, straight or reverse direct current.



A removable rheostat allows remote control. *Write*: Hobart Bros. Co., Hobart Square, Troy, O. *Phone*: 2-1223 (Metal Show Booth 2541)

Turk's-Head

Model 4TH combines the features of universal and plain type turk's-heads; rolls may be adjusted to conform to either arrangement.

Each pair of rolls may be set so that the face centerlines are aligned (as in the plain type) or offset (as in the universal type).

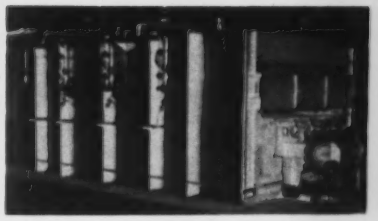
In either case, the roll pairs are infinitely adjustable within their limiting dimensions and impart the same qualities to the metal as a rolling mill operation—superior finish, accurate size and shape and improved grain structure. *Write*: Fenn Mfg. Co., Newington, Conn. *Phone*: Mohawk 6-2471 (Metal Show Booth 331)

Walking Beam Furnace

This furnace, built without alloy parts, is suited for high temperature forging operations, heat treating, annealing, etc.

Simple water-cooled I-beams eliminate warpage, fatigue and operating jams.

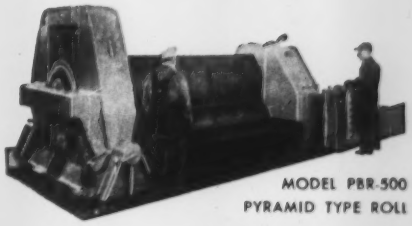
Air cylinders beneath the walking beam assembly reduce horsepower required and provide a snubbing action on the beam members to assure smoothness of movement. *Write*: Department D-6, Industrial



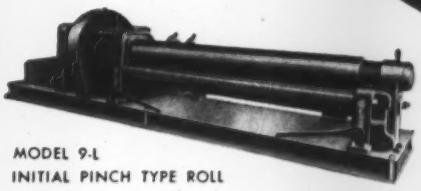
WEBB PLATE FABRICATING MACHINERY

PLATE BENDING ROLLS

The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.



MODEL PBR-500
PYRAMID TYPE ROLL

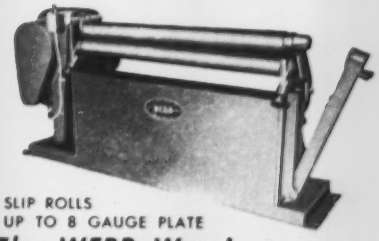


MODEL 9-L
INITIAL PINCH TYPE ROLL

Two types available: the Initial Pinch Type and Pyramid Type machines. All latest advantages of today's modern machine tools are incorporated, utilizing anti-friction bearings, totally enclosed gear drives. Special forming rolls for culvert pipe, stock tanks and other special shapes available.

SLIP ROLLS

A complete line of small Sheet Metal Forming Rolls are also available. All power-driven with shaft sizes 3" to 5" for the handling of the thinnest gauge material, up to 8 gauge material. Special rolls for the forming of polished sheets, aluminum and stainless steels can be furnished. Complete catalogues on any size machine furnished upon request; write Dept. D.



SLIP ROLLS
UP TO 8 GAUGE PLATE

Let Speed PAY—The WEBB Way!

SLIP ROLLS

PYRAMID TYPE ROLL

INITIAL TYPE ROLL

STEELWORKERS

Also Manufacturers of INDUSTRIAL WEIGHING EQUIPMENT

Since 1881 THE WEBB CORP.
WEBB CITY, MO., U.S.A.

Modified BAY STATE thread grinding wheel grooves the inner race of tiny ball bearing. Photo courtesy of Miniature Precision Bearings, Inc. at Keene, N.H.

Behind Controlled Flight . . . BAY STATE GRINDING WHEEL PRECISION!

Of tremendous importance to the effectiveness of guided missiles, jet planes, and other supersonic projectiles, is the *precise control* of their flight. The tiny instruments which give this control need unbelievably small bearings which must perform perfectly. One such ball bearing is shown full size on the page opposite.

Grinding such perfection into each ball-groove and face of these gem-like bearings demands grinding wheels with the most *dependable* uniformity of cutting action . . . in wheels down to the midgets which do their work *inside* the miniature bearings!

Electronic Formulation, the exclusive BAY STATE control which gives such complete grinding wheel uniformity, is one of the answers to this and many other grinding problems. "EF" uses the unerring accuracy of electronic computers to calculate precise amounts of each grinding wheel ingredient, and to "remember" these amounts on electronically punched cards.

Use BAY STATE as <u>your</u> source of abrasive engineering service and products to get up-to-the-minute grinding performance. Call in your local Bay State Distributor, or write directly to Bay State Abrasive Products Co., Westboro, Massachusetts. Branch Offices are located in Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; with distributors in all principal cities.

In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

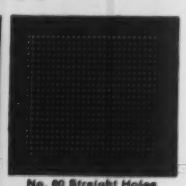
BAY STATE®

WHEELS of PROGRESS

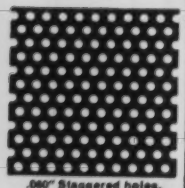
Manufacturers of <u>all</u> types of Quality Abrasive Products

Perforated Materials for *Every* Application

Contact H & K for any perforated materials your product may require.

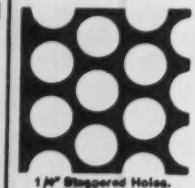


No. 60 Straight Holes
962 holes per sq. in.
.030" diam. 30% open.



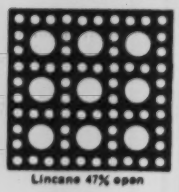
.060" Staggered holes.
196 holes per sq. in.
3/32" centers. 36% open.

We have tools for perforating thousands of different patterns.



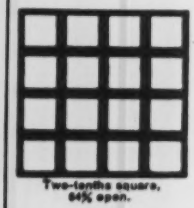
1/4" Staggered Holes.
5/16" centers.
.25" Diam. 58% open.

We will be glad to work with you on your perforating problems.



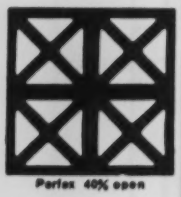
Lincane 47% open

See our catalog in Sweet's Product Design File.



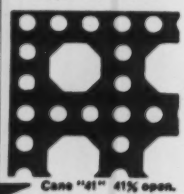
Two-tenths square,
64% open.

Perforating all metals, Masonite, plywood, paper, cloth and plastic.



Perlex 40% open

Round holes, square holes, slots, ornamental patterns, oblong holes, oval holes.



Cane "41" 41% open.

Fill-in and mail coupon to office and warehouse nearest you.

The **Harrington & King** PERFORATING CO.

Chicago Office and Warehouse
5627 Fillmore Street
Chicago 44, Ill.

New York Office and Warehouse
118 Liberty Street
New York, N. Y.

Please send me—

- ☐ GENERAL CATALOG NO. 62
- ☐ STOCK LIST of Perforated Steel Sheets
- ☐ SAMPLES of Perforated Plastics and Paper
- ☐ PRICE INFORMATION (NOTE: Send specifications of perforated materials wanted. If necessary send drawings or sketches.)

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

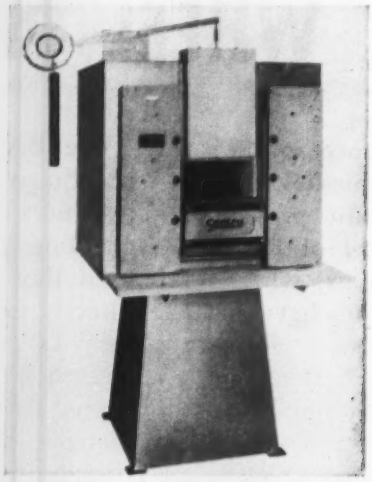
NEW PRODUCTS and equipment

Furnace Division, Sunbeam Corp., 4433 W. Ogden Ave., Chicago 23, Ill. *Phone*: Crawford 7-3225 (Metal Show Booth 942)

Steel Hardening Furnace

Model Y is an electric unit for high speed hardening.

Atmosphere is held constant automatically. Quality hardening, free from scale or decarburization,

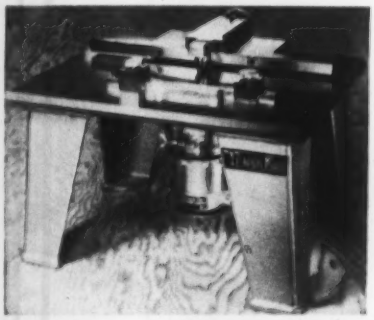


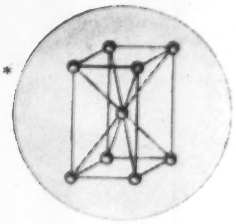
is produced on all types of tungsten, cobalt and molybdenum high speed steels and high carbon, high chrome die steels. *Write*: Sentry Co., Foxboro, Mass. *Phone*: 330 (Metal Show Booth 1203)

Tensile Testing

Tensilkut machines ferrous and nonferrous specimens (0.0005 to 0.500 in. thick) in less than 3 minutes.

Extremely fine edges are produced, with no cold working or evolution of heat. Unskilled tech-





+

Somers THIN STRIP

*PURE TIN plated on Somers Thin Strip.

Somers engineers have developed a special hot tin plate process which now will provide the smooth surface, solderability, adherence and complete absence of slag so essential to manufacturers of:

PRINTED CIRCUITS
CAPACITORS
CABLE WRAPPING

Tin coatings of .00002 to .00008 and .0002 to .0003 are available on brass, copper, bronze and other Thin Strip metals in gauges from .012 down to .002, widths from 1/8" to 6" and wider.

And, of course, Somers exacting standards for tolerance, tensile strength and other physical properties are rigidly maintained.

Whatever your requirements for tin plated thin strip, you can depend on Somers long experience and modern equipment for a quality product.

Write for further information and confidential data blank. Somers will gladly analyze your problem without obligation.

FOR EXACTING STANDARDS ONLY
Somers

Somers Brass Company, Inc.
104 BALDWIN AVE., WATERBURY, CONN

nicians find a precision master template controls specimen tolerances to ±0.0005 in. *Write*: Sieburg Industries Inc., Horse Plain Rd., New Britain, Conn. *Phone*: Baldwin 5-2226 (Metal Show Booth 2770)

Temperature Indicators

New Tempilstiks indicate when 525 and 575°F are reached. Indicators also come in liquid and tablet form. *Write*: Tempil° Corp., 132 W. 22nd St., New York 11, N. Y. *Phone*: Oregon 5-6610 (Metal Show Booth 929)

Controller

This Electromax nonrecording controller for thermocouples can be used through the entire heat treating range of common metals. The

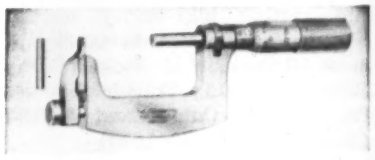
all-electronic unit has only one moving part.

Infrared gas analysis equipment also will be on exhibit. *Write*: Leeds & Northrup Co., Philadelphia 30, Pa. *Phone*: Michigan 4-4900 (Metal Show Booth 1129)

Micrometers

Interchangeable anvils are used on the 220 Mul-T-Anvil micrometer to handle a wide variety of measuring conditions.

A rod anvil is used to measure from a hole to an edge. With the

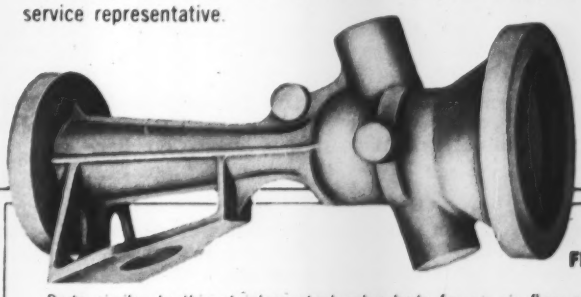


DESIGN PARTS FOR THE SHAPE YOU WANT—Investment Casting can produce the most intricately shaped parts with little or no secondary machining required.

CHOOSE THE ALLOY YOU WANT—Investment Castings are produced in any of the ferrous or non-ferrous alloys, including magnesium.

USE THE PROCESS WISELY—Give full consideration to weight, dimensions, tolerances and surface finishes when designing for Investment Casting. Take full advantage of the economies inherent in the process.

CONSULT ARWOOD ENGINEERS—Arwood casting engineers will gladly consult with you on your design and production problems, helping you translate them into finished products. Write for the name of your nearest ARWOOD sales and service representative.



DESIGN FLEXIBILITY

Parts similar to this stainless steel valve body for an air flow controller often require several changes before design is finalized. Due to the relatively low cost of dies and die changes, the investment casting process has proven an inexpensive and flexible method.

ARWOOD

ARWOOD PRECISION CASTING CORP.

327 W. 44th St. • New York 36, N. Y.

Plants: Brooklyn, N. Y. • Groton, Conn • Tilton, N. H. • Los Angeles, Calif.

"PIONEERS IN INVESTMENT CASTING"

flat anvil, distances from the inside of slots and grooves to an edge can be measured conveniently.

Additional anvils can be made for special jobs.

A vise-type frame holds the interchangeable anvils. The micrometers come in ranges of 0 to 1 in. and 1 to 2 in. *Write*: L. S. Starrett Co., Athol, Mass. *Phone*: 2160 (Metal Show Booth 919)

Finishing Compounds

An alkaline abrasive compound, FM 183, is for the deburring of steel, stainless steel and zinc diecastings.

FM 184 is an acidic compound that deburrs, removes heat scale and brightens steel, stainless steel, copper and brass parts.

FM 186 is an alkaline product for producing a brighter finish and better color on zinc diecastings. *Write*: Oakite Products Inc., 134E Rector St., New York 6, N. Y. *Phone*: Whitehall 3-0940 (Metal Show Booth 941)

FOR PICKLING, GALVANIZING AND PLATING

PROMAT assures you TOP performance.

IN ACID ADDITIVES

PROMAT'S acid additives are different from those of their competitors. With PROMAT additives you get *top performance* by depolarization. You get a more uniform etch resulting in a better surface for subsequent coatings such as galvanizing, plating, painting, etc.

The *anti-dusting* effect of depolarized pickling helps in prolonging the life of the rolls in the cold reduction operation. You get a rinse-free, dust-free, fine uniform etch without weight loss.

IN CONVERSION COATINGS

PROMAT offers you better finishes and anti-corrosive properties on zinc, cadmium, galvanizing and aluminum coatings.

IN PLATING SOLUTIONS

PROMAT is the largest supplier of acid zinc plating solutions for cyanide zinc, cadmium, white brass and copper.

IN GALVANIZING

PROMAT offers you *top performance* in galvanizing procedures by proper control from the pickling operation through the rinse and flux operations to the hot zinc kettle.

PROMAT also offers you a new additive for your lime bath for your rod and wire preparation before drawing. This new additive gives you better liming and lubrication to insure die life.

IN RESEARCH

PROMAT has an excellent research staff that will attack and solve your problem for you. Free technical information on any of PROMAT'S fine products are yours for the asking.

MANUFACTURING PLANTS LOCATED IN THE CITIES BELOW

WAUKEGAN, ILL. PHILADELPHIA, PA. GARDENA, CALIF.

PROMAT a division of POOR & CO.

851 S. Market St. Dept. S-10 Waukegan, Illinois

DISTRIBUTORS OF PROMAT'S GREAT LINE OF PROTECTIVE MATERIALS

Baker Dist., Cleveland, Crown Rheostat, Chicago, Haviland Co., Grand Rapids, Mich., Leco Engineering & Sales, Los Angeles, LaSalCo, St. Louis, Munning & Munning, New York & Newark, The Reynolds Co., Philadelphia, F. H. Ross Co., Charlotte, N. C., John Swift & Co., Canton, Conn., Sundmark Co., Los Angeles, Gus Walgren Co., Grand Rapids, Mich., Bill Young & Co., Cincinnati.

"PROMAT MEANS PROTECTIVE MATERIALS"

Paper Wipers

These sanitary wipers eliminate the danger of scarring finished surfaces. The large size is 9⅝ x 13⅝-in.; the small size is 9⅝ x 10¼-in. Both are two-ply sheets. *Write*: Scott Paper Co., Chester, Pa. *Phone*: Chester 4-4211 (Metal Show Booth 703)

Rust Preventive

Rust Veto M.P. is an indoor-type preventive which can be used at full strength or mixed with water, oil or solvent.

When mixed with water, it produces a nonvolatile solution.

Other products for the surface treatment of metals featured by the company include phosphating compounds, blackening salts, cold cleaners, pickling inhibitors and liquid carburizers. *Write*: E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. *Phone*: Regent 9-7100 (Metal Show Booth 1145)

Degreaser

All kinds of degreasing are done by this machine—vapor, vapor spray, liquid immersion and vapor rinse, double liquid immersion followed by vapor rinse or liquid immersion, spray and final rinse.

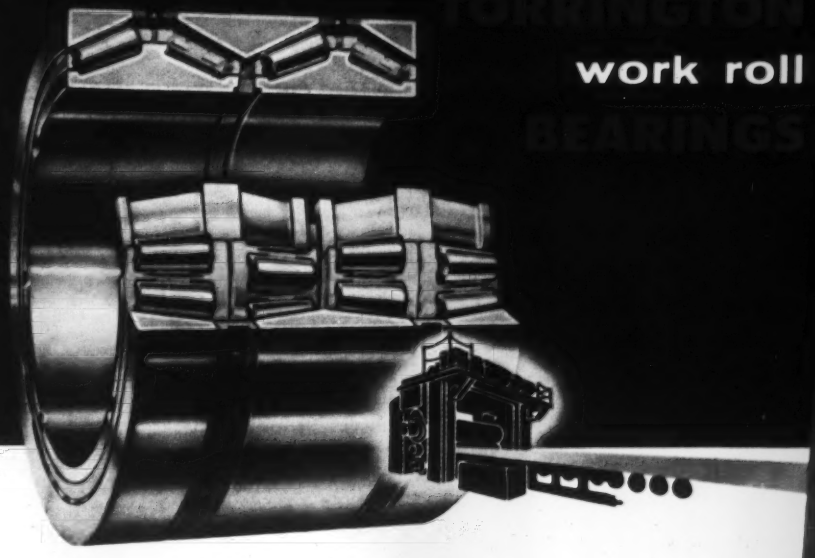
The unit incorporates 144 sq in. of ultrasonic transducers. *Write*: G. S. Blakeslee & Co., 1844 S. Laramie Ave., Cicero 50, Ill. *Phone*: Townhall 3-4100 (Metal Show Booth 1019)

Vacuum Furnace

The size and design of this production unit suit it for precision casters.

It has many features of the company's larger vacuum furnaces which are used for refining and casting high-purity metals. *Write*: Vacuum Processing Equipment Division, F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa. *Phone*: Cumberland 9-0100 (Metal Show Booth 1520)

roll higher tonnage records with TORRINGTON work roll BEARINGS



TORRINGTON WORK ROLL BEARINGS are helping to set new tonnage records wherever they are used. And why not! They're designed and built to do just that. Every detail of construction from the electric furnace steel used in their construction to the precision-ground races and rollers work to one objective: to provide the steel industry with the finest bearings possible for long, heavy-duty service. Keep your production rolling to new records. Both two-row and four-row types of TORRINGTON WORK ROLL BEARINGS are standard in a wide variety of sizes. Next time make it TORRINGTON. There's none better.

District offices and distributors in principal cities of United States and Canada

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller
Needle • Ball • Needle Rollers

THE TORRINGTON COMPANY

South Bend 21, Ind. Torrington, Conn.

THE TORRINGTON COMPANY 90th ANNIVERSARY 1866–1956

(Advertisement)

ACME-NEWPORT STEEL COMPANY

Newport, Kentucky

EFFECTIVE September 14th, 1956, the property and facilities formerly owned and operated by the Newport Steel Corporation, are now owned and will be operated by the Acme-Newport Steel Company, a wholly owned subsidiary of Acme Steel Company, Chicago, Illinois.

Acme Steel Company has been in business for 76 years and produces hot and cold rolled strip steel at its Riverdale Mill adjacent to Chicago. Our Company has developed a substantial business in special steel products such as Steel Strapping—Stitching Wire—Container Hoops—Floor Plate—Dexion Slotted Angle—Galvanized Flexible Conduit and other specialty products.

Acme-Newport Steel Company will continue to produce its present line of products. These will eventually be augmented by more steel specialties.

Present Newport Steel management will continue to administer the business with A. P. Miller as Vice President and General Manager, and Carl M. Riefkin as Vice President in Charge of Sales.

The consolidation of Acme Steel and Newport Steel brings many advantages to both companies and holds promise for more flexible application of their combined facilities to better serve users of steel throughout a broad range of industries.

Acme Steel Company, through its subsidiary the Acme-Newport Steel Company is happy to become part of the great Ohio Valley community and looks forward with confidence to participation in the growth and development of this prosperous area.

We welcome into the Acme Steel family all the present employees of Newport Steel. Their cooperation is sought in making this affiliation a successful enterprise . . . an enterprise which will result in benefit and security for our employees, our customers, the community of which we are a part and our thousands of shareholders.

Carl J. Sharp,
Chairman of the Board, Acme Steel Company

Frederick M. Gillies,
President, Acme Steel Company

ACME STEEL COMPANY, *Chicago, Illinois*

STEEL

October 1, 1956

Market Outlook

HERE'S a preview of the fourth quarter steel market: Demand for most forms will be strong. Supplies of some will be inadequate. Production will hug capacity marks. Prices may move upward in December.

DEMAND— Business as a whole is expected to have an all-time record quarter (see STEEL, Sept. 3, p. 45). Since metalworking is the largest segment of business in this country (accounting for one-third of our gross national product), it, too, will boom. Metal users will need a lot of steel. Contributing to the strength will be the largest user of metal—the automobile industry. It is scheduled to perk up this quarter with its 1957 models.

SUPPLY— As demand strengthens, steel supplies will tighten. The situation now is mixed. Some forms can be obtained quickly; some are moderately tight. Others, like plates and structural shapes, are almost impossible to get. Hot-rolled carbon sheets and oil country tubular goods are close runners-up.

The product which is expected to tighten the most noticeably is cold-rolled carbon steel sheets. That's because of the anticipated increase in demand from the auto industry. Around 40 per cent of the weight of each auto is cold-rolled sheets. Any upturn in demand by the auto industry is sure to be felt. It takes around 20 per cent of the finished tonnage coming from steel mills, more than any other single user.

PRODUCTION— Any insufficiency in the supply of steel will not stem from lack of production. Producers are turning out steel ingots at capacity rates. Steel demand will keep them at this level this quarter. The output of ingots should be a record 32 million net tons. This would represent an operating rate of 98.9 per cent of capacity.

In September, ingot production was approximately 10.5 million net tons. The record: Last March, 10,924,788 net tons were produced.

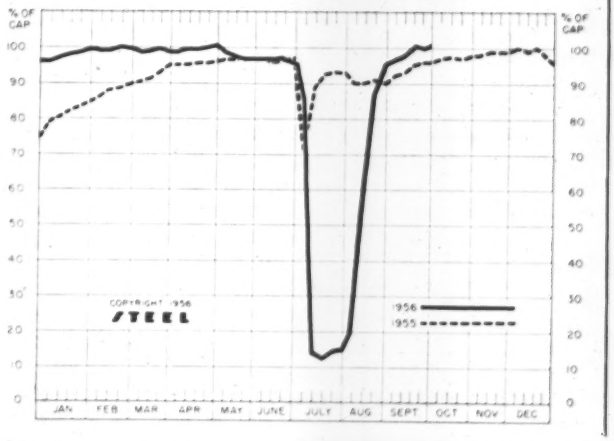
Output in the week ended Sept. 30 was at 100.5 per cent of capacity, compared with 100 in the preceding week.

FUTURE PRICES— The other thing to watch for in the fourth quarter is an increase in steel price extras. Increases stemming from the mid-1956 wage boost to steelworkers were on base prices only, and were smaller than most people had expected. A number of steel industry executives have openly said the increase is inadequate to cover cost increases. December would be a good month to bet on for upward adjustments in extras. That's after the national elections.

CURRENT PRICES— A few upward revisions are being made in prices of steel and on prices of materials the steel industry uses. The increases did not alter STEEL's price composite on finished steel. It holds at $137.75 a net ton. Lukens Steel Co., Coatesville, Pa., which raised clad steel plate prices in August, increased some of the nickel types again. Latest advances are around 5 per cent. Graphite and carbon electrodes for electric furnaces went up 8 per cent.

SCRAP— One material used by the steel industry—scrap—declined a little from the record level of $59.67 a gross ton. In the week ended Sept. 26, it receded to $58.17 a $1.50 drop.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended Sept. 30	Change	Same Week 1955	Same Week 1954
Pittsburgh	100	+ 1.5*	100	69
Chicago	101.5	— 0.5*	97	71
Mid-Atlantic	99.5	+ 1.5	94	58
Youngstown	102	0	100	57
Wheeling	101	+ 3.5	97.5	86.5
Cleveland	106.5	+ 1.5	99.5	77.5
Buffalo	107.5	0	105	68
Birmingham	97.5	+ 2	95.5	71
New England	91	— 1	88	48
Cincinnati	86	— 3	87	64
St. Louis	96.5	+ 8.5	88.5	69
Detroit	98	— 1	98.5	75
Western	99	0	98	87
National Rate	100.5	+ 0.5	96	68.5

INGOT PRODUCTION‡

	Week Ended Sept. 30	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	153.5†	154.2	148.7	145.7
NET TONS (In thousands)	2,466†	2,477	2,389	2,341

*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. Weekly capacity (net tons): 2,461,893 in 1956; 2,413,278 in 1955; 2,384,549 in 1954.

How many costs are hidden in using nickel scrap?

SOME that you know of — the cost of handling, the space it requires, and the melting loss you've already figured on.

But it's the unknowns — like the possible contamination of a heat — that can really hurt — that too often make this source of alloy metal a poor bargain at best.

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Major Industrial Components

(Per cent of respondents)

Three months from now inventories will be:

	Higher	Lower	The Same
Castings[1]	15 —	20 →	65
Other formed components[2]	8 —	24 →	68
Machined components[3]	10 →	19 ←	71
Fasteners	7 →	22 ←	71
Electrical equipment & motors	13 →	22 ←	65
Mechanical rubber goods & belting	4 →	17 ←	79

(Arrows show trend since STEEL's last report.)

[1]Die, gray iron, malleable, nonferrous, steel.
[2]Forgings, stampings, springs & wire shapes.
[3]Bearings, couplings, cylinders, gears, screw machine products.

Stock Cutting Continues

Industrial components appear in good supply as metalworking buyers continue to lower stocks to normal working levels. The pendulum could swing too far, however

THE LAST half of the year finds buyers of major industrial components voluntarily tightening their belts. The trend to lower stocks started during the second quarter (STEEL, July 2, p. 111), picked up speed in the third and will continue through the fourth (see table). Despite the steel strike, there's no sign that stocks are being cut because of shortages.

From July through September, 20 per cent of STEEL's respondents to its quarterly survey lowered their stocks of components. Only 14 per cent increased them (three months ago 21 per cent planned to build during the third quarter).

Movement—Fasteners, electrical equipment and motors, the only holdouts, joined the dominant trend last quarter.

Although 13 per cent of the respondents boosted fastener inventories in the second quarter and 12 per cent did so in the third, only 7 per cent plan to in the fourth. About 20 per cent will cut stocks this quarter.

Electrical equipment and motor supplies were lowered by 8 per cent in the second quarter, by 20 per cent in the third, and 22 per cent will do so in the fourth.

Shortages — There are some shortages, but they are scattered. Generally, 93 per cent of STEEL's respondents say deliveries from suppliers are adequate.

Antifriction bearings and some electric motors head the list of hard-to-find items. Some 10 per cent are concerned about bearings deliveries. At the same time, 7 per cent are maintaining higher than desired inventories of bearings to protect themselves against the shortage.

Metalworking buyers think the fourth quarter may be the best in the nation's history, and they foresee no trouble in meeting production schedules. If production moves at a faster rate than expected, you may see these same buyers hard pressed.

Anticipation — A Massachusetts machine maker and a Pennsylvania electrical equipment producer voice the typical reaction to STEEL's questionnaire: "Inventories have been higher than needed in anticipation of the steel strike and higher prices. With those two matters behind us, we know where we stand, and can cut back to normal levels of stock."

Stocks of components are steady in the 30-to-60-day category. Castings have eased up considerably. Last quarter, 20 per cent of the buyers had a shortage in one or more types of castings; now the figure is 10 per cent. Only one of 20 is experiencing a shortage in steel castings; last quarter one of ten did so.

Pendulum — A few purchasing agents point out the necessity of not allowing stocks to drop too much. Part of the psychology involved is a resistance to higher prices. It's just a matter of postponing the evil day, notes a Clevelander. Prices are up; there's nothing to be gained by cutting stocks below normal; there's plenty to lose.

Some buyers see the steel industry's three-year, no-strike contract as reason enough for holding inventories down. Since the steelworkers will get another raise in 1957, look for the pendulum to swing back toward higher inventories during the first half of the new year, as buyers anticipate higher steel costs.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 287 & 288

Automotive sheet requirements for the fourth quarter are not coming out in the volume anticipated by the mills. But volume is picking up, and releases are expected to rise steadily as the carbuilders swing actively into their 1957 model assembly schedules.

Producers are having no difficulty disposing of their output. Only in spots can hot-rolled sheets be

placed for late fourth quarter shipment, with most mill schedules filled. Cold-rolled tonnage is more freely available. Users apparently have bigger cold-rolled than hot-rolled inventories.

Galvanized and other zinc coated sheets are moving somewhat slower than cold-rolled. Orders can be placed for late fourth quarter delivery. Electrical sheets for fractional horsepower motors are less active than the transformer grades. Orders for 430 stainless sheets for automotive consumption are perking up. Low carbon strip can be had in four to six weeks by converters, high carbon in six to eight.

The relatively sluggish automotive demand largely reflects buying caution, pending determination of the public's reception of the new 1957 models.

Steel Bars . . .

Bar Prices, Page 286

Hot-rolled bars are in tighter supply despite the absence of heavy fourth quarter automotive buying. Apparently, automotive steel inventories are heavier than had been thought.

With an eye to probable automotive needs, barmakers are booking conservatively for fourth quarter. Should motor car demand fail to come up to expectations, supply conditions will ease noticeably. Despite the cautious booking, carryover tonnage is building up in hot bars.

Cold-finished sellers are not under great demand pressure. They hold substantial bookings for October and November shipment, but can take more fourth quarter orders, notably for December. Their supplies of hot bars are not all they might be, but, in the main, are adequate for current cold-finished volume demand.

Bar prices are steady at last August's levels. But rumblings of possible upward price adjustments around the end of the year are heard, probably in the way of increases in extras. This is largely speculation, based for the most part on views expressed by several steel company executives since the general increase in prices.

Plates . . .

Plate Prices, Page 286

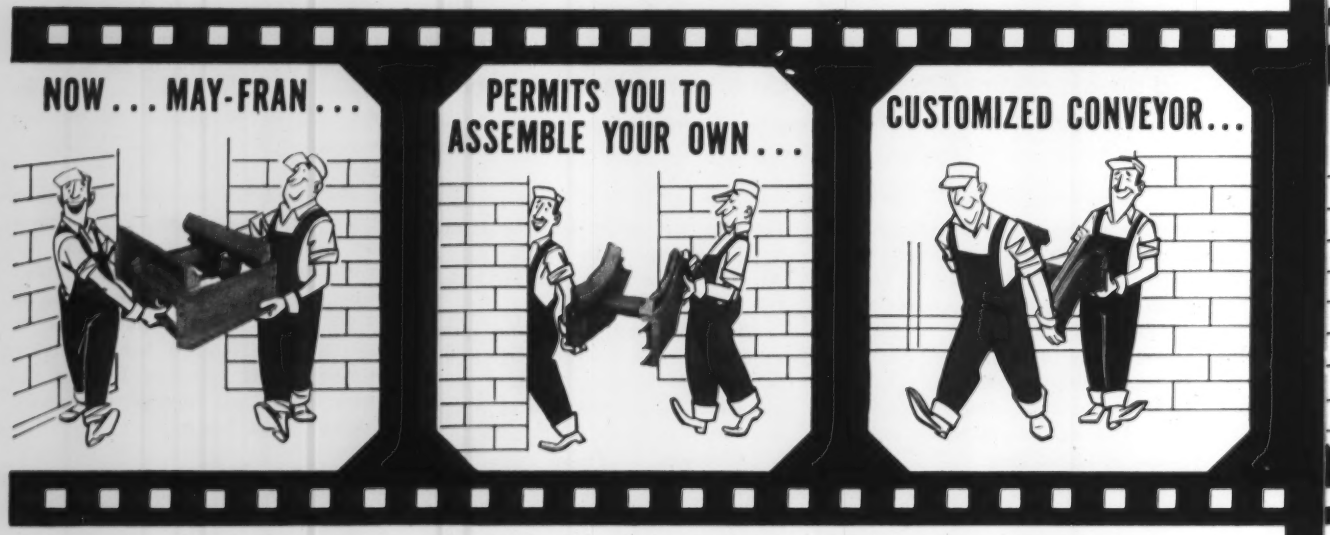
Plate mills are parceling out tonnage sparingly. Mill schedules for the fourth quarter are about filled. Shipments against delinquent orders are improving.

Fabricators are feeling the full impact of the midsummer production loss, notably those shops that operated throughout the strike. While fabricators are pinched for supplies, most of them think they will be able to get along if revised mill delivery schedules are maintained.

Not much relief from warehouse stocks will be possible. The distributors, like other buyers, can't get deliveries to replenish their depleted inventories.

Some light plate tonnage is coming from the strip mills to help meet the requirements of the car shops, shipbuilders, tankbuilders and others. Granite City Steel Co., for instance, is said to be rolling twice as much plate tonnage as it was a year ago.

Deliveries of clad carbon plates,



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Straight sections . . . concave or convex sections . . . take-up and discharge-end sections can be furnished to meet specific requirements of belt width as well as load bearing and volume capacities.

These pre-fabricated units are available rapidly and at low-cost. You save money many ways with MAY-FRAN standardization because . . . conveyors can be assembled by your own plant personnel . . . conveyors can be modified in any way when production needs change . . . conveyors can be dis-assembled and moved to other plant locations.

300 series, are more extended, around 18 weeks with leading producers. Straight chromium clad can be had in 14 weeks.

Lukens Steel Co., Coatesville, Pa., increased prices on nickel clad, Monel and Inconel plates, effective Sept. 21.

Lone Star Steel Co., Lone Star, Tex., raised prices on carbon plate about $7 a ton, effective Sept. 19. This action followed settlement of a strike at the company's works.

Wire . . .

Wire Prices, Pages 288 & 290

Wiremakers expect that automobile builders will be actively in the market over the next month or so, giving demand for the manufacturers grades of wire a decided lift. They anticipate the usual seasonal decline in merchant wire requirements. Building and highway demands are expected to hold up.

Nails and most merchant wire items can be placed for November shipment. Books on the manufacturers grades are pretty well filled for November, and December demand is coming out. Heaviest backlogs are in low carbon grades, notably the larger sizes required for reinforcing, including mesh and concrete pipe.

Tubular Goods . . .

Tubular Goods Prices, Page 292

Casing and line pipe order backlogs are reported heavy. Deliveries are extended. One major line pipe project reportedly can't get any sort of delivery promise before 1959. Oil country goods inventories are down. Buyers seeking replenishments are pressing mills.

Merchant pipe order books are pretty solidly filled for November, and December tonnage is being placed. Pipe jobbers who permitted their stocks to get low over the summer, are seeking to place tonnage for delivery in early first quarter, 1957.

Following the settlement of a strike at the plant of the Lone Star Steel Co., Lone Star, Tex., the company increased prices, effective Sept. 19, on cast iron pressure pipe $6 to $8 a ton, depending on size; $11.50 a ton on line pipe; and approximately $13.75 a ton on casing.

Page-Hersey Tubes Ltd. has announced a multimillion dollar expansion at its Welland, Ont., mills. Reason: Pipe will be needed for distribution lines when Alberta (Canada) gas becomes available in eastern Canada.

Structural Shapes . . .

Structural Shape Prices, Page 286

There's little chance tight supply conditions in structurals will ease for months to come. Shipments to fabricating shops are heavier, mostly tonnage against third quarter commitments. A large volume of wide flange and standard structurals is unplaced.

Fabricating shops are booking new business cautiously, keeping commitments close to anticipated steel allotments. Some jobs are going begging for estimates, with many fabricators booked up through 1957. Even smaller ton-

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nage for delivery in six months to a year is hard to place. Shops are sold up on future commitments and are behind on shipments and erection.

Another spurt in bridge tonnage is noted in New England. Highway departments are seeking to get steel under contract before end of 1956 for delivery in 1958.

Here and there, premium-priced structurals are offered at prices about double those posted in warehouse lists. The volume is less than during the steel strike. Only buyers in sore need of tonnage are tempted by such offers.

Rising costs and extended deliveries for erected fabricated steel are resulting in design changes to reinforced concrete. This includes two California state office buildings (one in San Francisco and a second in Los Angeles) involving expenditure of $16 million.

The higher cost of steel frame buildings on the West Coast, fabricated and erected, follows this curve: Office building placed early last year and completed in December, 1955, cost $185 a ton, Sacramento; Veterans' Hospital, Los Angeles, about completed, $325 a ton; and estimated for the two buildings mentioned above, $350 to $365 a ton.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 286

Illinois initiated construction on its $415 million toll road program Sept. 22 with a ceremony at Cherry Valley, 5 miles east of Rockford, where the first 4.7 miles of the 193-mile toll system will be built. Contract for $3,016,100 had been let to Public Constructors, a New Jersey company. Five prestressed concrete bridges will be built in the Cherry Valley area. From this point on, Illinois toll roads will require significant tonnages of steel reinforcing products.

Rails, Cars . . .

Track Material Prices, Page 290

The Gulf, Mobile & Ohio Railroad has placed an order with the Bessemer, Ala., plant of the Pullman-Standard Car Mfg. Co. for 250 fifty-ton boxcars, and with the Greenville Steel Car Co., Greenville, Pa., for 100 seventy-ton hopper cars. These orders are part of a program that will add 600 cars to the road's rolling stock at a cost of $5 million.

The Meridian, Miss., car shops of the road will assemble 250 fifty-ton capacity wood rack units, with steel underframes purchased from General Steel Castings Corp., St. Louis.

Tin Plate . . .

Tin Plate Prices, Page 288

Canmakers are expected to press for increased amounts of tin plate to be shipped prior to Oct. 31 to beat the 10-cent price advance which becomes effective then.

Consumption holds at a high level and is expected to be sustained even though can demand for the summer food pack is over.

Warehouse . . .

Warehouse Prices, Page 294

Pressure on distributors is slightly less than it was in late August and early September. Sales volume is moderately heavy but is

SPECTROGRAPHIC EQUIPMENT for Metal Analysis by 'Baird—Atomic

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B-A instruments provide rapid, accurate analysis . . . simple, stable operation, trouble-free economical performance.

The Direct Reading Spectrometer

Quality-control analytical laboratory for production and research. Simple, rapid operation — forty seconds for complete analysis on dials reading directly in percent concentration. Permanent optical alignment with the Automatic Servo Monitor. Other features include: unique (patented) measuring system . . . plug-in components assuring continuous operation . . . rugged design for plant operation . . . and versatile specimen holders.

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restricted by unbalanced stocks. Structurals and plates are tight, while cold-rolled and galvanized sheets are in relatively easy supply.

Warehouse operators in some districts say substantial tonnages of plates and structurals are moving to consumers through brokers and dealers at prices almost double standard warehouse quotations.

Some foreign sheet piling is arriving on the Pacific Coast, chiefly from Europe. Most of it is consigned to British Columbia.

Pig Iron . . . .

Pig Iron Prices, Page 294

Gray iron foundry operations are increasing and are expected to be reflected in pig iron shipments during October and later months. Chicago area jobbing shops are working 40 to 48 hours weekly, and they have order backlogs ranging up to eight weeks. Automotive foundries' melting schedules are accelerating to meet demand arising from production of new models. Farm implement and railroad castings shops, continue to operate on curtailed schedules.

On top of heavy domestic demand for iron, a tremendous amount of inquiry is being received from abroad. One Pittsburgh seller has turned down foreign inquiries estimated to total at least 500,000 tons over the last several months.

Youngstown Sheet & Tube Co. has blown out its No. 1 blast furnace at its Campbell Works for repairs.

Iron Ore . . .

Iron Ore Prices, Page 283

Shipments of iron ore on the Great Lakes totaled 3,099,965 gross tons in the week ended Sept. 24, reports the Lake Superior Iron Ore Association. This is down somewhat from the 3,252,527 tons moved in the preceding week, but tops, by a slight margin, the 3,078,622 tons shipped in the corresponding week a year ago.

Cumulative shipments to Sept. 24 were 51,706,298 gross tons. This is 13,227,488 tons under the 64,933,786 tons moved up to Sept. 24 last year.

Metallurgical Coke . . .

Metallurgical Coke Prices, Page 283

Demand for oven foundry coke expanded only moderately during September, but a substantial pick-up in buying is anticipated in this and succeeding months. A rising curve in foundry operations is counted on to increase fuel needs over the rest of the year.

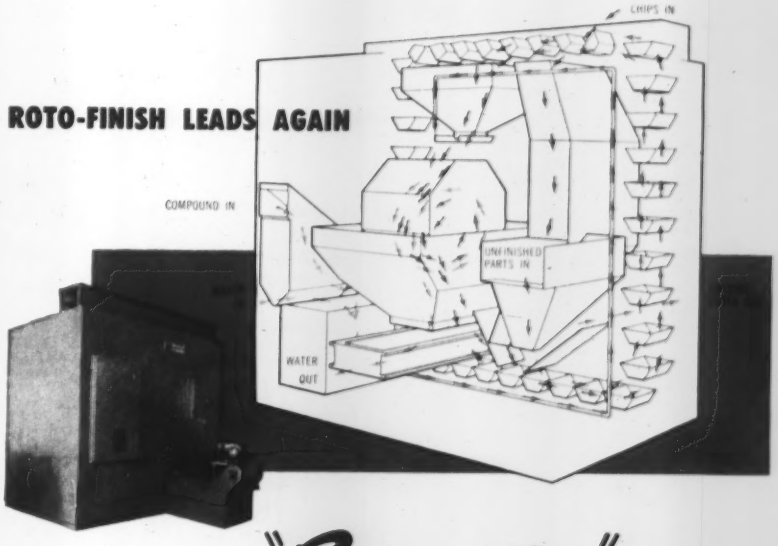
Production of coke in the U.S. in July totaled only 2,273,127 net tons, off 64 per cent from the preceding month, reports the Bureau of Mines. Output was the lowest since July 1952, due to the work stoppage in the steel industry.

Only a few oven-coke plants owned by steel companies operated in the month, and the rate of production for all furnace plants was 26.6 per cent of capacity.

Although merchant oven-coke plants were affected by the strike, they operated at a much higher

(*Please turn to page* 284)

ROTO-FINISH LEADS AGAIN



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Ores

Lake Superior Iron Ore

(Prices effective for the 1956 shipping season, gross tons, 51.50% iron natural, rail of vessel, lower lake ports.)

Old range bessemer	$11.25
Old range nonbessemer	11.10
Mesabi bessemer	11.00
Mesabi nonbessemer	10.85
Open-hearth lump	12.10
High phos.	10.85

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Dec. 1, 1955, and increases or decreases after such date are for seller's account.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

Foundry and basic 52-62% concentrates contract	17.00-18.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	25.00
N. African hematite (spot)	nom. 24.00-25.00
Brazilian iron ore, 68-69%	33.00

Tungsten Ore

Net ton unit, before duty

Foreign, wolframite, good commercial quality	$32.50-33.00
Domestic, scheelite, mine	63.00

Manganese Ore

Mn 48%, contracts, nominally $1.35-1.40, per long ton unit, c.i.f. U. S. ports, duty for buyer's account; 46-47% $1.10-1.15. Spot cargoes, 10 to 15% higher.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and African

48% 3:1	$52.00-53.50
48% 2.8:1	nom. 49.00-50.00
48% no ratio	39.00-40.00

South African Transvaal

48% no ratio	$35.00-36.00
44% no ratio	25.00-26.00

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulphide concentrate, per lb of Mo content, mines, unpacked	$1.18

Antimony Ore

Per unit of Sb content, c.i.f. seaboard

55-60%	$3.35-3.80
60-65%	3.80-3.90

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

Fluorspar

Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $38-39; 70%, $35-36; 60%, $31-32. Imported, net tons, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $34; Mexican, $26.50.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	36.00
Toluene, one deg.	32.00-34.00
Industrial xylene	32.00-35.00

Per ton, bulk, ovens

Ammonium sulfate	$32.00

Cents per pound, producing point

Phenol: Grade 1, 15.00; Grade 2-3, 14.50; Grade 4, 16.50; Grade 5, 15.25.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace	$14.25-14.75
Connellsville, foundry	17.00-18.00

Oven Foundry Coke

Birmingham, ovens	$27.60
Cincinnati, deld.	32.53
Buffalo, ovens	29.50
Camden, N. J., ovens	28.50
Detroit, ovens	29.50
Pontiac, deld.	31.15
Saginaw, deld.	32.73
Erie, Pa., ovens	27.50
Everett, Mass., ovens New England, deld.	30.55*
Indianapolis, ovens	28.75
Ironton, O., ovens	28.00
Cincinnati, deld.	28.25
Kearny, N. J., ovens	28.75
Lone Star, Tex., ovens	25.50
Milwaukee, ovens	29.50
Painesville, O., ovens	29.50
Cleveland, deld.	31.55
Philadelphia, ovens	28.50
St. Louis, ovens	28.50
Neville Island (Pittsburgh), Pa., ovens	28.25
St. Paul, ovens	28.50
Chicago, deld.	31.82
Swedeland, Pa. ovens	28.50
Terre Haute, Ind., ovens	28.75

*Or within $4.55 freight zone from works.

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $128; Salina, Pa., $133; Niles, O., $138; Cutler, Utah, $148.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Pa., New Savage, Md., St. Louis, $165; Stevens Pottery, Ga., $175.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, O., Hawstone, Pa., $140; Warren, Niles, Windham, O., Hays, Latrobe, Morrisville, Pa., $145; E. Chicago, Ind., Joliet, Rockdale, Ill., $150; Lehigh, Utah, $165; Los Angeles, $170.

Super-Duty: Hays, Sproul, Hawstone, Pa., Niles, Warren, Windham, O., Leslie, Md., Athens, Tex., $157; Morrisville, Latrobe, Pa., $160; Curtner, Calif., $182.

Semisilica Brick (per 1000)

Clearfield, Pa., $145; Woodbridge, N. J., $128; Philadelphia, $130.

Ladle Brick (per 1000)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, O., $96; Clearfield, Pa., Portsmouth, O., $98.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $220; Danville, Ill., $223; Philadelphia, Clearfield, Pa., $230.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $275; Danville, Ill., $278; Philadelphia, Clearfield, Pa., $285.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $315; Danville, Ill., $318; Philadelphia, Clearfield, Pa., $325.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $177; Clearfield, Pa., $189.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $292; Clearfield, Pa., $311.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $221; Clearfield, Pa., $236.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, O., Gibsonburg, Narlo, O., $16; Thornton, McCook, Ill., $15.60; Dolly Siding, Bonne Terre, Mo., $15.

Magnesite (per net ton)

Domestic, dead-burned, bulk ¼-in. grains with fines: Chewelah, Wash., $43; Luning, Nev. $43; ⅝-in. grains with fines: Baltimore $69.40.

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(Concluded from page 281)

rate, averaging 71.3 per cent of capacity. Stocks of oven coke at producers' plants increased 35 per cent. Stocks of coking coal decreased 6 per cent.

Total production of coke (oven and beehive) in the first seven months this year was 42,161,864 tons, of which 40,614,731 tons were oven coke and 1,547,133 tons, beehive.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

500 tons, addition to Crown-Zellerbach pulp plant, West Linn, Oreg., to Pacific Car & Foundry Co., Seattle.

400 tons, barracks and miscellaneous facilities, Naval air station, Oceana, Va., to Globe Iron Construction Co., Norfolk, Va.; Virginia Engineering Co. Inc., Newport News, Va., general contractor.

370 tons, Mercy Hospital addition, Scranton, Pa., to Anthracite Bridge Co., Scranton, Pa.

360 tons, manufacturing plant, S.O.&C. Division, United Shoe Machinery Corp., Shelton, Conn., to Topper & Griggs (Bethlehem Fabricators Inc.) Hartford, Conn.; Edwin Moss & Son Inc., Bridgeport, Conn., general contractor.

300 tons, maintenance hangar, Naval air station, Chincoteague, Va., to Globe Iron Construction Co., Norfolk, Va.; Irons & Reynolds Inc., Washington, general contractor.

285 tons, women's physical education building, University of Massachusetts, Amherst, Mass., to Haarmann Structural Steel Co., Holyoke, Mass.; M. J. Walsh & Sons Inc., Holyoke, general contractor.

250 tons, also reinforcing and piling, Washington state truss bridge, to unstated interest; C. B. Croy, Bellingham, Wash., general contractor.

240 tons, ventilation and control center, substation, expressway, Boston, to Bethlehem Steel Co., Bethlehem, Pa.; Tornabene Bros. Co., Newton Upper Falls, Mass., general contractor; 50 tons, reinforcing bars, Joseph T. Ryerson & Son Inc., Boston.

195 tons, including reinforcing bars, dormitory, Trinity College, Burlington, Vt., to Vermont Structural Steel Corp., Burlington; Wright & Morrissey Inc., Burlington, general contractor.

125 tons, manufacturing plant, Sanborn Co., Route 128, Waltham, Mass., to West End Iron Works, Cambridge, Mass., Aberthaw Construction Co., Boston, general contractor; 40 tons, reinforcing bars, Concrete Steel Co., Boston.

STRUCTURAL STEEL PENDING

5000 tons, steel sheet piling, cofferdam, lock and dam No. 41, Louisville; bids to Corps of Engineers, Louisville.

2500 tons, 1387-ft bridge, seven-deck girder spans, Minnesota river, Bloomington, Minn.

360 tons, I-beam bridges, Pottstown, Pa.; bids Oct. 11, Harrisburg; also 100 tons, reinforcing bars and 939 linear ft, 14 to 32-ft steel beam piles.

275 tons, one I-beam and one plate girder bridge, Greenwich township, Berks county, Pennsylvania; bids Oct. 11, Harrisburg; also 165 tons, reinforcing bars.

221 tons, Washington state undercrossing, Pierce county; bids to Olympia, Wash., Oct. 9.

150 tons, including 65 tons of reinforcing bars, two state bridges, Gloucester, Mass.

100 tons, including 25 tons of reinforcing bars, three bridges, Oxford-Southbury, Conn.

100 tons, 35-ton gantry crane for Dallas powerhouse; Cyclops Iron Works, San Francisco, low at $113,434, to U.S. Engineer, Portland, Oreg.

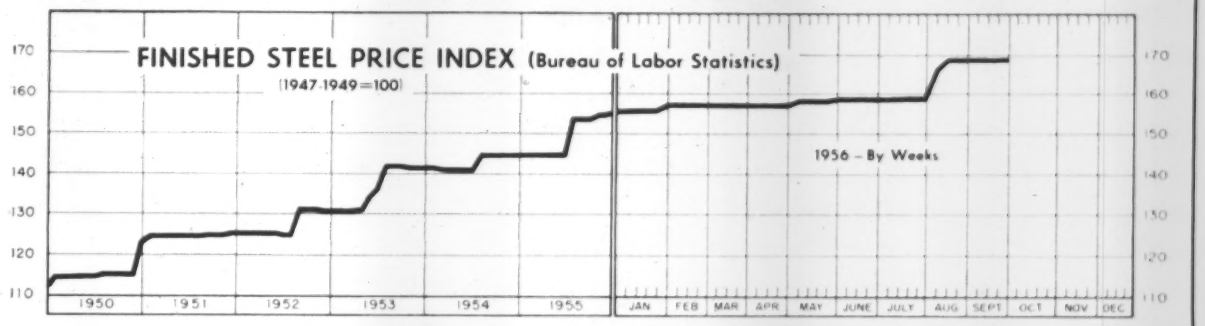
REINFORCING BARS . . .

REINFORCING BARS PLACED

2000 tons, storage tanks, Lehigh-Portland

(Please turn to page 296)

Price Indexes and Composites



Sept. 25, 1956	Week Ago	Month Ago	Sept. Avg.	Year ago
168.6	168.6	168.6	168.6	153.9

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Sept. 25

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.150	Bars, Reinforcing	5.738
Rails, Light, 40 lb	6.567	Bars, C.F., Carbon	9.610
Tie Plates	6.025	Bars, C.F., Alloy	13.275
Axles, Railway	8.950	Bars, C.F., Stainless, 302 (lb)	0.508
Wheels, Freight Car, 33 in. (per wheel)	57.50	Sheets, H.R., Carbon	5.695
Plates, Carbon	5.550	Sheets, C.R., Carbon	6.639
Structural Shapes	5.267	Sheets, Galvanized	8.220
Bars, Tool Steel, Carbon (lb)	0.480	Sheets, C.R., Stainless, 302 (lb)	0.635
Bars, Tool Steel Alloy, Oil Hardening Die (lb)	0.585	Sheets, Electrical	11.225
Bars, Tool Steel, H. R. Alloy, High Speed W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.274	Strip, C.R., Carbon	8.843
Bars, Tool Steel, H.R., Alloy, High Speed W18 Cr 4, V 1 (lb)	1.769	Strip, C.R., Stainless, 403 (lb)	0.475
Bars, H.R., Alloy	10.025	Strip, H.R., Carbon	5.900
Bars, H.R., Stainless, 303 (lb)	0.483	Pipe, Black, Buttweld (100 ft)	18.376
Bars, H.R., Carbon	5.925	Pipe, Galv., Buttweld (100 ft)	22.516
		Pipe, Line (100 ft)	182.860
		Casing, Oil Well, Carbon (100 ft)	178.046
		Casing, Oil Well, Alloy (100 ft)	276.870
		Tubes, Boiler (100 ft)	45.033
		Tubing, Mechanical, Carbon (100 ft)	22.973
		Tubing, Mechanical, Stainless, 304 (100 ft)	187.133
		Tin Plate, Hot-dipped, 1.25 lb	9.333
		Tin Plate, Electrolytic, 0.25 lb	8.033
		Black Plate, Canmaking Quality	7.133
		Wire, Drawn, Carbon	9.175
		Wire, Drawn, Stainless, 430 (lb)	0.630
		Bale ties (bundle)	7.213
		Nails, Wire, 8d Common	9.388
		Wire, Barbed (80-rod spool)	8.412
		Woven Wire Fence (20-rod roll)	20.505

STEEL's FINISHED STEEL PRICE INDEX*

	Sept. 26 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Index (1935-39 av.=100)	225.71	225.71	225.71	207.63	171.92
Index in cents per lb	6.114	6.114	6.114	5.625	4.657

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT*	$137.75	$137.75	$137.75	$127.41	$106.32
No. 2 Fdry Pig Iron, GT	62.63	62.63	62.63	58.99	52.54
Basic Pig Iron, GT	62.18	62.18	62.18	58.49	52.16
Malleable Pig Iron, GT	63.41	63.41	63.41	59.77	53.27
SteelmakingScrap, GT	58.17	59.67	58.85	45.00	44.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 84; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL

	Sept. 26 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bars, H.R., Pittsburgh	5.075	5.075	5.075	4.65	3.70
Bars, H.R., Chicago	5.075	5.075	5.075	4.65	3.70
Bars, H.R., deld., Philadelphia	4.93	4.93	4.93	4.90	4.223
Bars, C.F., Pittsburgh	6.85*	6.85*	6.85*	5.90	4.55
Shapes, Std., Pittsburgh	5.00	5.00	5.00	4.60	3.65
Shapes, Std., Chicago	5.00	5.00	5.00	4.60	3.65
Shapes, deld., Philadelphia	5.00	5.00	5.00	4.88	3.918
Plates, Pittsburgh	4.85	4.85	4.85	4.50	3.70
Plates, Chicago	4.85	4.85	4.85	4.50	3.70
Plates, Contesville, Pa.	5.25	5.25	5.25	4.50	4.15
Plates, Sparrow Point, Md.	4.85	4.85	4.85	4.50	3.70
Plates, Claymont, Del.	5.35	5.35	5.35	4.50	4.15
Sheets, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.60-3.75
Sheets, H.R., Chicago	4.675	4.675	4.675	4.325	3.60
Sheets, C.R., Pittsburgh	5.75	5.75	5.75	5.325	4.35
Sheets, C.R., Chicago	5.75	5.75	5.75	5.325	4.35
Sheets C.R., Detroit	5.75-5.85	5.75-5.85	5.75-5.85	5.325-5.425	4.55
Sheets, Galv., Pittsburgh	6.30	6.30	6.30	5.85	4.80
Strip, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.75-4.00
Strip, H.R., Chicago	4.675	4.675	4.675	4.325	3.50
Strip, C.R., Pittsburgh	6.85	6.85	6.85	6.25-6.45	4.65-5.35
Strip, C.R., Chicago	6.85	6.85	6.85	6.35-6.45	4.90
Strip, C.R., Detroit	6.95	6.95	6.95	6.35	4.85-5.60
Wire, Basic, Pittsburgh	7.20	7.20	7.20	6.25	4.85-5.10
Nails, Wire, Pittsburgh	8.35	8.35	8.35	7.60	5.90-6.20
Tin plate (1.50 lb), box, Pitts.	$9.85	$9.85	$9.85	$9.05	$8.70

*Including 0.35c for special quality

SEMIFINISHED STEEL

Billets forging, Pitts. (NT)	$91.50	$91.50	$91.50	$84.50	$66.00
Wire rods, $\frac{7}{32}$-$\frac{9}{16}$" Pitts.	5.80	5.80	5.80	5.025	4.10-4.30

PIG IRON, Gross Ton

	Sept. 26 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bessemer, Pitts.	$63.50	$63.50	$63.50	$59.50	$53.00
Basic, Valley	62.50	62.50	62.50	58.50	52.00
Basic deld. Phila.	66.26	66.26	66.26	59.16	56.61
No. 2 Fdry, NevilleIsland, Pa.	63.00	63.00	63.00	59.00	52.50
No. 2 Fdry, Chicago	63.00	63.00	63.00	59.00	52.50
No. 2 Fdry, deld. Phila.	66.76	66.76	66.76	59.66	57.11
No. 2 Fdry, Birm.	59.00	59.00	59.00	55.00	48.88
No. 2 Fdry (Birm.) deld. Cin.	66.70	66.70	66.70	62.70	55.49
Malleable, Valley	63.00	63.00	63.00	59.00	52.50
Malleable, Chicago	63.00	63.00	63.00	59.00	52.50
Ferromanganese, Duquesne	215.00†	215.00†	215.00†	190.00†	188.00*

†74-76% Mn, net ton; *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)

No. 1 Heavy Melt, Pittsburgh	$56.50	$58.50	$58.50	$43.50	$45.00
No. 1 Heavy Melt, E. Pa.	58.00	59.00	59.00	46.50	43.50
No. 1 Heavy Melt, Chicago	60.00	61.50	59.00	45.00	43.50
No. 1 Heavy Melt, Valley	65.50	65.50	64.50	46.50	45.00
No. 1 Heavy Melt, Cleve.	63.00	63.00	62.00	44.00	44.00
No. 1 Heavy Melt, Buffalo	57.50	56.50	56.50	38.50	44.00
Rails, Rerolling, Chicago	84.50	84.50	83.50	64.50	52.50
No. 1 Cast, Chicago	53.50	53.50	53.50	47.50	49.00

COKE, Net Ton

Beehive, Furn. Connlsvl.	$14.50	$14.50	$14.50	$13.625	$14.75
Beehive, Fdry, Connlsvl.	17.50	17.50	17.50	16.50	17.50

Steel Prices

Mill prices as reported to STEEL, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers page 287; to footnotes, page 290.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)
Munhall,Pa. U5 ....$70.50

INGOTS, Alloy (NT)
Detroit R7 .....$74.00
Houston 85 .....74.00
Midland,Pa. C18 .....74.00
Munhall,Pa. U5 .....74.00

BILLETS, BLOOMS & SLABS
Carbon, Rerolling (NT)
Aliquippa,Pa. J5 ....$74.00
Bessemer,Pa. U5 .....74.00
Bridgeport,Conn. N19..79.00
Buffalo R2 .....74.00
Clairton,Pa. U5 .....74.00
Ensley,Ala. T2 .....74.00
Fairfield,Ala. T2 .....74.00
Fontana,Calif. K1 ....83.50
Gary,Ind. U5 .....74.00
Johnstown,Pa. B2 .....74.00
Lackawanna,N.Y. B2..74.00
LoneStar,Tex. L6 .....80.00
Munhall,Pa. U5 .....74.00
Pittsburgh J5 .....74.00
S.Chicago,Ill. R2, U5..74.00
S.Duquesne,Pa. U5....74.00
Sterling,Ill. N15 .....74.00
Youngstown R2 .....74.00

Carbon, Forging (NT)
Aliquippa,Pa. J5 ....$91.50
Bessemer,Pa. U5 .....91.50
Bridgeport,Conn. N19 ..96.50
Buffalo R2 .....91.50
Canton,O. R2 .....94.00
Clairton,Pa. U5 .....91.50
Conshohocken,Pa. A3 ..96.50
Ensley,Ala. T2 .....91.50
Fairfield,Ala. T2 .....91.50
Fontana,Calif. K1 ....101.00
Gary,Ind. U5 .....91.50
Geneva,Utah C11 .....91.50
Houston 85 .....96.50
Johnstown,Pa. B2 .....91.50
Lackawanna,N.Y. B2. 91.50
LosAngeles B3 .....101.00
Midland,Pa. C18 .....91.50
Munhall,Pa. U5 .....91.50
Pittsburgh J5 .....91.50
Seattle B3 .....105.00
S.Chicago R2, U5, W14 91.50
S.Duquesne,Pa. U5 ....91.50
S.SanFrancisco B3 ..101.00

Alloy, Forging (NT)
Bethlehem,Pa. B2 ..$107.00
Bridgeport,Conn. N19 .107.00
Buffalo R2 .....107.00
Canton,O. R2 .....107.00
Conshohocken,Pa. A3 .114.00
Detroit R7 .....107.00
Fontana,Calif. K1 ....128.00
Gary,Ind. U5 .....107.00
Houston 85 .....112.00
Ind.Harbor,Ind. Y1 ..107.00
Johnstown,Pa. B2 ....107.00
Lackawanna,N.Y. B2 .107.00
LosAngeles B3 .....127.00
Massillon,O. R2 .....107.00
Midland,Pa. C18 ....107.00
Munhall,Pa. U5 .....107.00
S.Chicago R2,U5,W14 .107.00
S.Duquesne,Pa. U5 ..107.00
Struthers,O. Y1 .....107.00
Warren,O. C17 .....107.00

ROUNDS, SEAMLESS TUBE (NT)
Bridgeport,Conn. N19 $116.50
Buffalo R2 .....111.50
Canton,O. R2 .....114.00
Cleveland R2 .....111.50
Gary,Ind. U5 .....111.50
S.Chicago,Ill. R2, W14 111.50
S.Duquesne,Pa. U5 ..111.50

SKELP
Aliquippa,Pa. J5 .....4.725
LoneStar,Tex. L6 .....5.025
Munhall,Pa. U5 .....4.625
SparrowsPoint,Md. B2 .4.625
Warren,O. R2 .....4.625
Youngstown R2, U5 ..4.625

WIRE RODS
AlabamaCity,Ala. R2 ..5.80
Aliquippa,Pa. J5 .....5.80
Alton,Ill. L1 .....6.00
Buffalo W12 .....5.80
Cleveland A7 .....5.80
Donora,Pa. A7 .....5.80
Fairfield,Ala. T2 .....5.80
Houston 85 .....6.05
IndianaHarbor,Ind. Y1 .5.80
Johnstown,Pa. B2 .....5.80
Joliet,Ill. A7 .....5.80
KansasCity,Mo. 85 ....6.05
Kokomo,Ind. C16 .....5.90
LosAngeles B3 .....6.60
Minnequa,Colo. C10 ...6.05
Monessen,Pa. P7 .....5.80
N.Tonawanda,N.Y. B11 .5.80
Pittsburg,Calif. C11 ....6.45
Portsmouth,O. P12 ....5.80
Roebling,N.J. R5 .....5.90
S.Chicago,Ill. R2 .....5.80
SparrowsPoint,Md. B2 ..5.90
Sterling,Ill.(1) N15 ....5.80
Sterling,Ill. N15 .....5.90
Struthers,O. Y1 .....5.80
Worcester,Mass. A7 ....6.10

STRUCTURALS

Carbon Steel Std. Shapes
Ala.City,Ala. R2 .....5.00
Aliquippa,Pa. J5 .....5.00
Bessemer,Ala. T2 .....5.00
Bethlehem,Pa. B2 .....5.05
Birmingham C15 .....5.30
Clairton,Pa. U5 .....5.00
Fairfield,Ala. T2 .....5.00
Fontana,Calif. K1 ....5.70
Gary,Ind. U5 .....5.00
Geneva,Utah C11 .....5.00
Houston 85 .....5.10
Ind.Harbor,Ind. I-2 ....5.00
Johnstown,Pa. B2 .....5.05
KansasCity,Mo. 85 ....5.10
Lackawanna,N.Y. B2 ..5.05
LosAngeles B3 .....5.70
Minnequa,Colo. C10 ....5.30
Munhall,Pa. U5 .....5.00
Niles,Calif. P1 .....5.75
Phoenixville,Pa. P4 ....5.85
Portland,Oreg. O4 .....5.80
Seattle B3 .....5.75
S.Chicago,Ill. U5, W14 ..5.00
S.SanFrancisco B3 ....5.65
Sterling,Ill. N15 .....5.00
Torrance,Calif. C11 ....5.70
Weirton,W.Va. W6 ....5.00

Wide Flange
Bethlehem,Pa. B2 .....5.05
Clairton,Pa. U5 .....5.00
Fontana,Calif. K1 .....5.85
IndianaHarbor,Ind. I-2..5.00
Lackawanna,N.Y. B2 ..5.05
Munhall,Pa. U5 .....5.00
Phoenixville,Pa. P4 ....5.85
S.Chicago,Ill. U5 .....5.00

Alloy Std. Shapes
Clairton,Pa. U5 .....6.20
Fontana,Calif. K1 .....7.85
Gary,Ind. U5 .....6.20
Houston 85 .....6.30
Munhall,Pa. U5 .....6.20
S.Chicago,Ill. U5 .....6.20

H.S., L.A. Std. Shapes
Aliquippa,Pa. J5 .....7.35
Bessemer,Ala. T2 .....7.35
Bethlehem,Pa. B2 .....7.40
Clairton,Pa. U5 .....7.35
Fairfield,Ala. T2 .....7.35
Fontana,Calif. K1 .....8.05
Gary,Ind. U5 .....7.35
Geneva,Utah C11 .....7.35
Houston 85 .....7.45
Ind.Harbor,Ind. I-2, Y1 7.35
Johnstown,Pa. B2 .....7.40
KansasCity,Mo. 85 ....7.45
Lackawanna,N.Y. B2 ..7.40
LosAngeles B3 .....8.05
Munhall,Pa. U5 .....7.35
Seattle B3 .....8.10
S.Chicago,Ill. U5, W14..7.35
S.SanFrancisco B3 ....8.00
Struthers,O. Y1 .....7.35

H.S., L.A. Wide Flange
Bethlehem,Pa. B2 .....7.40
Ind.Harbor,Ind. I-2 ....7.35
Lackawanna,N.Y. B2 ..7.40
Munhall,Pa. U5 .....7.35
S.Chicago,Ill. U5 .....7.35

PILING

BEARING PILES
Bethlehem,Pa. B2 .....5.05
Lackawanna N.Y. B2 ....5.05
Munhall,Pa. U5 .....5.00
S.Chicago,Ill. U5 .....5.00

STEEL SHEET PILING
Ind.Harbor,Ind. I-2 ...5.90
Lackawanna,N.Y. B2 ..5.90
Munhall,Pa. U5 .....5.90
S.Chicago,Ill. U5 .....5.90

PLATES

PLATES, Carbon Steel
Ala.City,Ala. R2 .....4.85
Aliquippa,Pa. J5 .....4.85
Ashland,Ky. (15) A10..4.85
Bessemer,Ala. T2 .....4.85
Bridgeport,Conn. N19 ..4.75
Clairton,Pa. U5 .....4.85
Claymont,Del. C22 ....5.35
Cleveland J5, R2 .....4.95
Coatesville,Pa. L7 ....5.25
Conshohocken,Pa. A3 ..4.90
Detroit M1 .....4.60
Ecorse,Mich. G5 .....4.95
Fairfield,Ala. T2 .....4.85
Fontana,Calif.(30) K1 .5.55
Gary,Ind. U5 .....4.85
Geneva,Utah C11 .....4.85
GraniteCity,Ill. G4 ....5.05
Harrisburg,Pa. P4 ....5.80
Houston 85 .....4.95
Ind.Harbor,Ind. I-2, Y1 4.85
Johnstown,Pa. B2 .....4.85
Lackawanna,N.Y. B2 ..4.85
LoneStar,Tex. L6 .....5.20
Minnequa,Colo. C10 ....5.70
Munhall,Pa. U5 .....4.85
Newport,Ky. N9 .....4.85
Pittsburgh J5 .....4.85
Riverdale,Ill. A1 .....4.85
Seattle B3 .....5.75
Sharon,Pa. S3 .....4.85
S.Chicago,Ill. U5, W14 ..4.85
SparrowsPoint,Md. B2 ..4.85
Steubenville,O. W10 ....4.85
Warren,O. R2 .....4.85
Weirton,W.Va. W6 ....4.85
Youngstown R2, U5, Y1 4.85

PLATES, Carbon Abras. Resist.
Claymont,Del. C22 ....6.20
Fontana,Calif. K1 ....6.70
Geneva,Utah C11 .....6.00
Johnstown,Pa. B2 .....5.65
SparrowsPoint,Md. B2 ..5.65

PLATES, Wrought Iron
Economy,Pa. B14 ....11.128

PLATES, High-Strength Low-Alloy
Aliquippa,Pa. J5 .....7.25
Bessemer,Ala. T2 .....7.25
Clairton,Pa. U5 .....7.25
Claymont,Del. C22 .....7.55
Cleveland J5, R2 .....7.25
Coatesville,Pa. L7 .....7.55
Conshohocken,Pa. A3 ..7.25
Ecorse,Mich. G5 .....7.35
Fairfield,Ala. T2 .....7.25
Fontana,Calif.(30) K1 ..7.95
Gary,Ind. U5 .....7.25
Geneva,Utah C11 .....7.25
Houston 85 .....7.35
Ind.Harbor,Ind. I-2, Y1 7.25
Johnstown,Pa. B2 .....7.25
Munhall,Pa. U5 .....7.25
Pittsburgh J5 .....7.25
Seattle B3 .....8.15
Sharon,Pa. S3 .....7.25
S.Chicago,Ill. U5, W14 .7.25
SparrowsPoint,Md. B2 ..7.25
Warren,O. R2 .....7.25
Youngstown U5, Y1 ....7.25

PLATES, Alloy
Bridgeport,Conn. N19 ..6.55
Claymont,Del. C22 ....6.85
Coatesville,Pa. L7 ....6.85
Fontana,Calif.(30) K1 ..7.55
Gary,Ind. U5 .....6.85
Houston 85 .....6.95
Ind.Harbor,Ind. Y1 ...6.85
Johnstown,Pa. B2 .....6.85
Munhall,Pa. U5 .....6.85
Newport,Ky. N9 .....6.85
Seattle B3 .....7.75
Sharon,Pa. S3 .....6.85
S.Chicago,Ill. U5, W14 .6.85
SparrowsPoint,Md. B2 ..6.85
Youngstown Y1 .....6.85

FLOOR PLATES
Cleveland J5 .....5.925
Conshohocken,Pa. A3 ..5.925
Harrisburg,Pa. P4 ....6.275
Ind.Harbor,Ind. I-2 ...5.925
Munhall,Pa. U5 .....5.925
S.Chicago,Ill. U5 ....5.925

PLATES, Ingot Iron
Ashland c.l. (15) A10 .5.10
Ashland l.c.l. (15) A10..5.60
Cleveland c.l. R2 .....5.60
Warren,O. c.l. R2 .....5.60

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)
Ala.City,Ala.(9) R2 ..5.075
Aliquippa,Pa.(9) J5 ..5.075
Alton,Ill. L1 .....5.275
Atlanta(9) A11 .....5.575
Bessemer,Ala.(9) T2 ..5.075
Birmingham(9) C15 ...5.375
Bridgeport,Conn. N19 ..5.30
Buffalo(9) R2 .....5.075
Clairton,Pa. U5 .....5.075
Cleveland(9) R2 .....5.075
Ecorse,Mich.(9) G5 ...5.175
Emeryville,Calif. J7 ...5.85
Fairfield,Ala.(9) T2 ...5.075
Fairless,Pa.(9) U5 ...5.225
Fontana,Calif.(9) K1 ..5.775
Gary,Ind.(9) U5 .....5.075
Geneva(9) C11 .....5.175
Houston(9) 85 .....5.325
Ind.Harbor(9) I-2, Y1 .5.075
Johnstown,Pa.(9) B2 ..5.075
Joliet,Ill. P22 .....5.575
KansasCity,Mo.(9) 85 .5.325
Lackawanna(9) B2 .....5.075
LosAngeles(9) B3 .....5.775
Midland,Pa.(9) C18 ...5.425
Milton,Pa.(23) M18 ...5.425
Minnequa,Colo. C10 ...5.525
Niles,Calif. P1 .....5.85
N.T'wanda,N.Y.(9)B11 5.075
Pittsburg,Calif.(9) C11 5.775
Pittsburgh(9) J5 .....5.075
Portland,Oreg. O4 .....5.85
Seattle B3, N14 .....5.825
S.Ch'c'go(9) R2,U5,W14 5.075
S.Duquesne,Pa.(9) U5 .5.075
S.SanFran.,Calif.(9) B3 5.825
Sterling,Ill.(1) N15 ..5.075
Sterling,Ill. N15 .....5.175
Struthers,O. Y1 .....5.075
Torrance,Calif.(9) C11 5.775
Weirton,W.Va.(9)W6 ..5.075
Youngstown(9) R2, U5 5.075

BARS, H.R. Leaded Alloy (Including leaded extra)
Warren,O. C17 .....7.125

BARS, Hot-Rolled Alloy
Bethlehem,Pa. B2 ....6.125
Bridgeport,Conn. N19 ..6.20
Buffalo R2 .....6.125
Canton,O. R2 .....6.125
Clairton,Pa. U5 .....6.125
Detroit R7 .....6.125
Ecorse,Mich. G5 .....6.225
Fairless,Pa. U5 .....6.275
Fontana,Calif. K1 .....7.175
Gary,Ind. U5 .....6.125
Houston 85 .....6.375
Ind.Harbor,Ind. I-2, Y1 6.125
Johnstown,Pa. B2 .....6.125
KansasCity,Mo. 85 ...6.375
Lackawanna,N.Y. B2 ..6.125
LosAngeles B3 .....7.175
Massillon,O. R2 .....6.125
Midland,Pa. C18 .....6.125
S.Chicago R2, U5, W14 6.125
S.Duquesne,Pa. U5 ....6.125
Struthers,O. Y1 .....6.125
Warren,O. C17 .....6.125
Youngstown U5 .....6.125

BARS & SMALL SHAPES, H.R. High-Strength Low-Alloy
Aliquippa,Pa. J5 ....7.425
Bessemer,Ala. T2 ....7.425
Bethlehem,Pa. B2 ....7.425
Bridgeport,Conn. N19 ..7.50
Clairton,Pa. U5 .....7.425
Cleveland R2 .....7.425
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.425
Fontana,Calif. K1 .....8.125
Gary,Ind. U5 .....7.425
Houston 85 .....7.675
Ind.Harbor,Ind. Y1 ...7.425
Johnstown,Pa. B2 .....7.425
KansasCity,Mo. 85 ....7.675
Lackawanna,N.Y. B2 ..7.425
LosAngeles B3 .....8.125
Pittsburgh J5 .....7.425
Seattle B3 .....8.175
S.Chicago U5, W14 ...7.425
S.Duquesne,Pa. U5 ....7.425
S.SanFrancisco B3 ....8.175
Struthers,O. Y1 .....7.425
Youngstown U5 .....7.425

BAR SIZE ANGLES; H.R. Carbon
Bethlehem,Pa.(9) B2 ..5.225
Lackawanna(9) B2 .....5.075
Sterling,Ill. N15 .....5.175
Sterling,Ill.(1) N15 ....5.075

BAR SIZE ANGLES; S. Shapes
Aliquippa,Pa. J5 ....5.075
Atlanta A11 .....5.575
Fontana,Calif. K1 .....5.35
Joliet,Ill. P22 .....5.10
Niles,Calif. P1 .....5.85
Pittsburgh J5 .....5.075
Portland,Oreg. O4 .....5.85
SanFrancisco S7 .....5.95

BAR SHAPES, Hot-Rolled Alloy
Clairton,Pa. U5 .....6.20
Gary,Ind. U5 .....6.20
Houston 85 .....6.45
KansasCity,Mo. 85 ....6.45
Youngstown U5 .....6.20

BARS, C.F. Leaded Alloy (Including leaded extra)
Ambridge,Pa. W18 ....9.225
Chicago W18 .....9.225
Cleveland C20 .....9.475
LosAngeles S30 .....10.60
Monaca,Pa. S17 .....9.225
Newark,N.J. W18 .....9.40
Warren,O. C17 .....9.475

BARS, Cold-Finished Carbon
Ambridge,Pa. W18 ....6.85
BeaverFalls,Pa. M12,R2 6.85
Bridgeport,Conn. N19 ..7.20
Buffalo B5 .....6.90
Camden,N.J. P13 .....7.30
Carnegie,Pa. C12 .....6.85
Chicago W18 .....6.85
Cleveland A7, C20 ....6.85
Detroit B5, P17 .....7.05
Detroit R7 .....6.85
Donora,Pa. A7 .....6.85
Elyria,O. W8 .....6.85
FranklinPrk,Ill. N5 ....6.85
Gary,Ind. U5 .....6.85
GreenBay,Wis. F7 .....6.85
Hammond,Ind. L2, M13 .6.85
Hartford,Conn. R2 ....7.35
Harvey,Ill. B5 .....6.85
LosAngeles(49) S30 ....8.30
LosAngeles R2 .....8.30
Mansfield,Mass. B5 ....7.40
Massillon,O. R2, R8 ...6.85
Midland,Pa. C18 .....6.85
Monaca,Pa. S17 .....6.85
Newark,N.J. W18 .....7.30
NewCastle,Pa.(17) B4 ..6.85
Pittsburgh J5 .....6.85
Plymouth,Mich. P5 ....7.10
Putnam, Conn. W18 ....7.40
Readville,Mass. C14 ....7.40
S.Chicago,Ill. W14 ....6.85
SpringCity,Pa. K3 .....7.30
Struthers,O. Y1 .....6.85
Waukegan,Ill. A7 .....6.85
Youngstown F3, Y1 ....6.85

BARS, Cold-Finished Carbon (Turned and Ground)
Cumberland,Md.(5) C19..6.10

BARS, Cold-Finished Alloy
Ambridge,Pa. W18 ....8.325
BeaverFalls,Pa. M12,R2 8.325
Bethlehem,Pa. B2 .....8.325
Bridgeport,Conn. N19 ..8.475
Buffalo B5 .....8.325
Camden,N.J. P13 .....8.50
Canton,O. T7 .....7.425
Carnegie,Pa. C12 .....8.325
Chicago W18 .....8.325
Cleveland A7, C20 ....8.325
Detroit B5, P17 .....8.525
Detroit R7 .....8.325
Donora,Pa. A7 .....8.325
Elyria,O. W8 .....8.325
FranklinPark,Ill. N5 ..8.325
Gary,Ind. R2 .....8.325
GreenBay,Wis. F7 .....8.325
Hammond,Ind. L2,M13 .8.325
Hartford,Conn. R2 ....8.625
Harvey,Ill. B5 .....8.325
Lackawanna,N.Y. B2 ..8.325
LosAngeles S30 .....10.10
Mansfield,Mass. B5....8.625
Massillon,O. R2, R8 ...8.325
Midland,Pa. C18 .....8.325
Monaca,Pa. S17 .....8.325
Newark,N.J. W18 .....8.50
Plymouth,Mich. P5 ....8.525
S.Chicago W14 .....8.325
SpringCity,Pa. K3 .....8.50
Struthers,O. Y1 .....8.325
Warren,O. C17 .....8.325
Waukegan,Ill. A7 .....8.325
Worcester,Mass. A7 ...8.625
Youngstown F3, Y1 ...8.325

BARS, Reinforcing (To Fabricators)
Ala.City,Ala. R2 .....5.075
Atlanta A11 .....5.575
Birmingham C15 .....5.375
Bridgeport,Conn. N19 ..5.30
Buffalo R2 .....5.075
Cleveland R2 .....5.075
Ecorse,Mich. G5 .....5.425
Emeryville,Calif. J7 ....5.85
Fairfield,Ala. T2 .....5.075
Fairless,Pa. U5 .....5.225
Fontana,Calif. K1 .....5.80

Ft. Worth, Tex. (42) T4 ..5.525
Gary, Ind. U5 .....5.075
Houston 85 .....5.325
Ind. Harbor, Ind. I-2, Y1 5.075
Johnstown, Pa. B2 .....5.075
Joliet, Ill. P22 .....5.575
Kansas City, Mo. 85 ....5.325
Lackawanna, N.Y. B2 ..5.075
Los Angeles B3 .....5.775
Milton, Pa. M18 .....5.225
Minnequa, Colo. C10 ..5.525
Niles, Calif. P1 .....5.85
Pittsburg, Calif. C11 ..5.775
Pittsburgh J5 .....5.075
Portland, Oreg. O4 .....5.85
Sand Springs, Okla. 85..5.575
Seattle B3, N14 .....5.825
S. Chicago R2 .....5.075
S. Duquesne, Pa. U5 ...5.075
S. San Francisco B3 ....5.825
Sparrows Point, Md. B2..5.075
Sterling, Ill. (1) N15 ...5.075
Sterling, Ill. N15 .....5.175
Struthers, O. Y1 .....5.075
Torrance, Calif. C11 ...5.775
Youngstown R2, U5....5.075

BARS, Reinforcing (Fabricated; to Consumers)

Chicago U8 .....6.81
Cleveland U8 .....6.79
Johnstown, Pa. ¼-1" B2..6.73
Kansas City, Kans. 85 ..6.825
Marion, O. P11 .....6.15
New York U8 .....7.18
Pittsburgh U8 .....6.75
Seattle B3, N14 .....7.20
Sparrows Pt. ¼-1" B2 ..6.73
Williamsport, Pa. S19 ..6.65

RAIL STEEL BARS

Chicago Hts. (3) C2, I-2.5.075
Chicago Hts. (4) I-2 ....5.075
Chicago Hts. (4) C2 .....5.65
Ft. Worth, Tex. (26) T4..5.525
Franklin, Pa. (4) F5 ....5.60
Franklin, Pa. (3) F5 ....5.10
Jersey Shore, Pa. (4) J8 ..5.00
Marion, O. (3) P11 .....4.65
Moline, Ill. (3) R2 .....5.225
Tonawanda (3) B12 .....5.65
Tonawanda (4) B12 .....6.15
Williamsport, Pa. (3) S19.5.65

BARS, Wrought Iron

Economy, Pa. (S.R.) B14 12.305
Economy, Pa. (D.R.) B14 15.301
Economy (Staybolt) B14 15.676
McK. Rks. (S.R.) L5 ..12.305
McK. Rks. (D.R.) L5 ...16.00
McK. Rks. (Staybolt) L5.17.00

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

Ala. City, Ala. R2 .....4.675
Allenport, Pa. P7 .....4.675
Ashland, Ky. (8) A10 ..4.675
Cleveland J5, R2 .....4.675
Conshohocken, Pa. A3 .4.725
Detroit (8) M1 .....4.775
Dravosburg, Pa. U5 ....4.675
Ecorse, Mich. G5 .....4.775
Fairfield, Ala. T2 .....4.675
Fairless, Pa. U5 .....4.725
Fontana, Calif. K1 ....5.475
Gary, Ind. U5 .....4.675
Geneva, Utah C11 .....4.775
Granite City, Ill. (8) G4..4.875
Ind. Harbor, Ind. I-2, Y1 4.675
Lackawanna, N.Y. B2..4.675
Munhall, Pa. U5 .....4.675
Newport, Ky. (8) N9 ..4.675
Niles, O. M21 .....4.675
Pittsburg, Calif. C11 ..5.375
Pittsburgh J5 .....4.675
Portsmouth, O. P12 ....4.675
Riverdale, Ill. A1 .....4.675
Sharon, Pa. S3 .....4.675
S. Chicago, Ill. W14 ...4.675
Sparrows Point, Md. B2..4.675
Steubenville, O. W10 ..4.675
Warren, O. R2 .....4.675
Weirton, W. Va. W6 ....4.675
Youngstown U5, Y1 ..4.675

SHEETS, H.R., (19 ga. & Lighter)

Niles, O. M21 .....5.75

SHEETS, H.R. Alloy

Dravosburg, Pa. U5 .....7.75
Gary, Ind. U5 .....7.75
Ind. Harbor, Ind. Y1 ...7.75
Newport, Ky. N9 .....7.75
Youngstown Y1, U5 ...7.75

SHEETS, H.R. (14 Ga. & Heavier) High-Strength Low-Alloy

Cleveland J5, R2 .....6.90
Conshohocken, Pa. A3 ..6.95
Dravosburg, Pa. U5 ....6.90
Ecorse, Mich. G5.....7.00
Fairfield, Ala. T2 .....6.90
Fairless, Pa. U5 .....6.95
Fontana, Calif. K1 .....7.70
Gary, Ind. U5 .....6.90
Ind. Harbor, Ind. Y1 ..6.90
Lackawanna (35) B2 ....6.90
Munhall, Pa. U5 .....6.90
Pittsburgh J5 .....6.90
S. Chicago, Ill. U5 .....6.90
Sparrows Point (36) B2 ..6.90
Warren, O. R2 .....6.90
Weirton, W. Va. W6 ....6.90
Youngstown U5, Y1 ....6.90

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland, Ky. (8) A10 ...4.925
Cleveland R2 .....5.425
Ind. Harbor, Ind. I-2 ...4.925
Warren, O. R2 .....5.425

SHEETS, Cold-Rolled Steel (Commercial Quality)

Allenport, Pa. P7 .....5.75
Cleveland J5, R2 .....5.75
Conshohocken, Pa. A3 ...5.80
Dravosburg, Pa. U5 ....5.75
Detroit M1 .....5.75
Ecorse, Mich. G5 .....5.85
Fairfield, Ala. T2 .....5.75
Fairless, Pa. U5 .....5.80
Follansbee, W. Va. F4 ..5.75
Fontana, Calif. K1 .....6.95
Gary, Ind. U5 .....5.75
Granite City, Ill. G4 ....5.95
Ind. Harbor, Ind. I-2, Y1 5.75
Lackawanna, N.Y. B2 ..5.75
Mansfield, O. E6 .....5.75
Middletown, O. A10 ....5.75
Newport, Ky. N9 .....5.75
Pittsburg, Calif. C11 ...6.70
Pittsburgh J5 .....5.75
Portsmouth, O. P12 .....5.75
Sparrows Point, Md. B2 ..5.75
Steubenville, O. W10 ....5.75
Warren, O. R2 .....5.75
Weirton, W. Va. W6 ....5.75
Youngstown Y1 .....5.75

SHEETS, Cold-Rolled High-Strength, Low-Alloy

Cleveland J5, R2 .....8.525
Dravosburg, Pa. U5 ....8.525
Ecorse, Mich. G5 .....8.625
Fairless, Pa. U5 .....8.575
Fontana, Calif. K1 ....9.725
Gary, Ind. U5 .....8.525
Indiana Harbor, Ind. Y1..8.525
Lackawanna (37) B2 ..8.525
Pittsburgh J5 .....8.525
Sparrows Point (38) B2 .8.525
Warren, O. R2 .....8.525
Weirton, W. Va. W6 ....8.525
Youngstown Y1 .....8.525

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....6.50
Middletown, O. A10 ....6.25
Warren, O. R2 .....6.50

SHEETS, Culvert	Cu Steel	Cu Fe
Ashland, Ky.	A10 6.65	6.90
Canton, O.	R2 ..6.65	7.15
Dravosburg	U5 ..6.65	6.90
Fairfield	T2 ....6.65	6.90
Gary, Ind.	U5 ...6.65	6.90
Ind. Harbor	I-2 ..6.65	6.90
Kokomo, Ind.	C16..6.75	...
Martins Fry.	W10..6.65	...
Pitts., Calif.	C11..7.40	...
Sparrows Pt.	B2..6.65	...

SHEETS, Culvert—Pure Iron

Dravosburg U5 .....6.90
Gary, Ind. U5 .....6.90
Ind. Harbor, Ind. I-2 ....6.90
Martins Fry., O. W10 ....6.90

SHEETS, Galvanized Steel Hot-Dipped

Ala. City, Ala. R2 .....6.30‡
Ashland, Ky. A10 .....6.30†
Canton, O. R2 .....6.30‡
Dover, O. R1 .....6.30†
Dravosburg, Pa. U5 ...6.30†
Fairfield, Ala. T2 .....6.30†
Gary, Ind. U5 .....6.30†
Granite City, Ill. G4 ....6.50‡
Ind. Harbor, Ind. I-2 ..6.30†
Kokomo, Ind. C16 .....6.40‡
Martins Ferry, O. W10 ..6.30*
Middletown, O. A10 ...6.30†
Pittsburg, Calif. C11 ...7.05*
Pittsburgh J5 .....6.30†
Sparrows Pt., Md. B2 ..6.30†
Warren, O. R2 .....6.30†
Weirton, W. Va. W6 ....6.30*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana, Calif. K1 ....6.975

SHEETS, Galvanized High-Strength Low-Alloy

Dravosburg, Pa. U5 ...9.275
Sparrows Point (39) B2..9.275

SHEETS, Galvannealed Steel

Canton, O. R2 .....6.70
Dravosburg, Pa. U5 .....6.70
Kokomo, Ind. C16 .....7.00

SHEETS, Galvanized Ingot Iron (Hot-dipped Continuous)

Ashland, Ky. A10 .....6.55
Middletown, O. A10 .....6.55

SHEETS, Electrogalvanized

Cleveland (28) R2.....7.125
Niles, O. (28) R2 .....7.125
Weirton, W. Va. W6 ....6.975

SHEETS, Aluminum Coated

Butler, Pa. A10 (type 1) 8.95
Butler, Pa. A10 (type 2) 9.05

SHEETS, Enameling Iron

Ashland, Ky. A10 .....6.325
Cleveland R2 .....6.325
Dravosburg, Pa. U5 ....6.325
Gary, Ind. U5 .....6.325
Granite City, Ill. G4 ....6.525
Ind. Harbor, Ind. I-2, Y1 6.325
Middletown, O. A10 ....6.325
Niles, O. M21 .....6.325
Youngstown Y1 .....6.325

BLUED STOCK, 29 Gage

Follansbee, W. Va. F4 ..8.35
Ind. Harbor, Ind. I-2 ...8.175
Yorkville, O. W10 .....8.175

SHEETS, Long Terne Steel (Commercial Quality)

Beech Bottom, W. Va. W10 6.70
Gary, Ind. U5 .....6.70
Mansfield, O. E6 .....6.70
Middletown, O. A10 ....6.70
Niles, O. M21 .....6.70
Weirton, W. Va. W6 ....6.70

SHEETS, Long Terne, Ingot Iron

Middletown, O. A10 ....7.10

Key To Producers

A1 Acme Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.

B1 Babcock & Wilcox Co.
B2 Bethlehem Steel Co.
B3 Beth. Pac. Coast Steel
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div. Colo. Fuel & Iron
B11 Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div. Borg-Warner Corp.
C4 Carpenter Steel Co.
C7 Cleve. Cold Rolling Mills
C8 Cold Metal Products Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div. H. K. Porter Co. Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.

D2 Detroit Steel Corp.
D3 Dearborn Division Sharon Steel Corp.
D4 Disston & Sons, Henry
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas & Fuel Assoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire Steel Corp.

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div. Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins, E., Steel Tube
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L5 Lockhart Iron & Steel
L6 Lone Star Steel Co.
L7 Lukens Steel Co.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M13 Monarch Steel Div., Jones & Laughlin Steel Corp.
M14 McInnes Steel Co.
M16 Md. Fine & Special. Wire
M17 Metal Forming Corp.
M18 Milton Steel Division, Merritt-Chapman & Scott
M21 Mallory-Sharon Titanium Corp.

N1 National Standard Co.
N2 National Supply Co.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N9 Newport Steel Corp.
N14 Northwest. Steel Roll. Mill
N15 Northwestern S. & W. Co.
N16 New Delphos Mfg. Co.
N19 Northeastern Steel Corp.
O3 Oliver Iron & Steel Corp.
O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co. Sub. of Barium Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Division, Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts. Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., Amer. Chain & Cable
P17 Plymouth Steel Co.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.

R1 Reeves Steel & Mfg. Co.
R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R7 Rotary Electric Steel Co.
R8 Reliance Div., Eaton Mfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Steel Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Corp.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service

T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Prod. & Chem.
T4 Texas Steel Co.
T5 Thomas Strip Division, Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div. Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div. U. S. Steel Corp.

V2 Vanadium-Alloys Steel
V3 Vulcan Crucible Div., H. K. Porter Co. Inc.

W1 Wallace Barnes Co.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W7 W. Va. Steel & Mfg. Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.
W19 Worcester Pressed Steel

Y1 Youngstown Sheet & Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2	4.675
Allenport,Pa. P7	4.675
Alton,Ill. L1	4.875
Ashland,Ky.(8) A10	4.675
Atlanta A11	4.875
Bessemer,Ala. T2	4.675
Birmingham C15	4.975
Bridgeport,Conn. N19	4.625
Buffalo(27) R2	4.675
Conshohocken,Pa. A3	4.725
Detroit M1	4.775
Ecorse,Mich. G5	4.775
Fairfield,Ala. T2	4.675
Fontana,Calif. K1	5.475
Gary,Ind. U5	4.675
Houston S5	4.925
Ind.Harbor,Ind. I-2, Y1	4.675
Johnstown,Pa.(25) B2	4.675
KansasCity S5	4.925
Lackawanna,N.Y.(25) B2	4.675
LosAngeles(25) B3	5.425
Minnequa,Colo. C10	5.775
Pittsburg,Calif. C11	5.425
Riverdale,Ill. A1	4.675
SanFrancisco S7	5.95
Seattle(25) B3	5.675
Seattle N14	5.675
Sharon,Pa. S3	4.675
S.Chicago,Ill. W14	4.675
S.SanFrancisco(25) B3	5.425
SparrowsPoint,Md. B2	4.675
Sterling,Ill.(1) N15	4.675
Sterling,Ill. N15	4.775
Torrance,Calif. C11	5.425
Warren,O. R2	4.675
Weirton,W.Va. W6	4.675
Youngstown U5	4.675

STRIP, Hot-Rolled Alloy

Bridgeport,Conn. N19	7.50
Carnegie,Pa. S18	7.75
Dravosburg U5	7.75
Fontana,Calif. K1	9.65
Gary,Ind. U5	7.75
Ind.Harbor,Ind. Y1	7.75
Los Angeles B3	8.95
Newport,Ky. N9	7.75
Sharon,Pa. S3	7.75
S. Chicago W14	7.75
Youngstown U5, Y1	7.75

STRIP, Hot-Rolled High-Strength, Low-Alloy

Bessemer,Ala. T2	6.95
Conshohocken,Pa. A3	6.95
Ecorse,Mich. G5	7.05
Fairfield,Ala. T2	6.95
Fontana,Calif. K1	8.025
Gary,Ind. U5	6.95
Houston S5	7.20
Ind.Harbor,Ind. I-2, Y1	6.95
KansasCity,Mo. S5	7.20
Lackawanna,N.Y. B2	6.95
LosAngeles(25) B3	7.70
Seattle(25) B3	7.95
Sharon,Pa. S3	6.95
S.SanFrancisco(25) B3	7.70
SparrowsPoint,Md. B2	6.95
Warren,O. R2	6.95
Weirton,W.Va. W6	6.95
Youngstown U5, Y1	6.95

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	4.925
Warren,O. R2	5.425

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	6.85
Baltimore T6	6.85
Boston T6	7.40
Buffalo S40	6.85
Cleveland A7, J5	6.85
Conshohocken,Pa. A3	6.90
Dearborn,Mich. D3	6.95
Detroit D2, M1, P20	6.95
Dover,O. G6	6.85
Ecorse,Mich. G5	6.95
Follansbee,W.Va. F4	6.85
Fontana,Calif. K1	8.60
FranklinPark,Ill. T6	6.95
Ind.Harbor,Ind. Y1	6.85
Indianapolis C8	7.00
Lackawanna,N.Y. B2	6.25
LosAngeles C1	8.90
NewBedford,Mass. R10	7.30
NewBritain(10) S15	6.85
NewCastle,Pa. B4, E5	6.85
NewHaven,Conn. D2	7.30
NewKensington,Pa. A6	6.85
Pawtucket,R.I. R3	7.50
Pawtucket,R.I. N8	7.40
Pittsburgh J5	6.85
Riverdale,Ill. A1	6.95
Rome,N.Y. (32) R6	6.85
Sharon,Pa. S3	6.85
SparrowsPt., Md. B2	6.25
Trenton,N.J.(31) R5	8.40
Wallingford,Conn. W2	7.30
Warren,O. R2, T5	6.85
Weirton,W.Va. W6	6.85
Worcester,Mass. A7	7.40
Youngstown C8, Y1	6.85

STRIP, Cold-Rolled Alloy

Boston T6	14.90
Carnegie,Pa. S18	14.55
Cleveland A7	14.55
Dover,O. G6	14.55
FranklinPark,Ill. T6	14.55
Harrison,N.J. C18	14.55
Indianapolis C8	14.70
Pawtucket,R.I. N8	14.90
Sharon,Pa. S3	14.55
Worcester,Mass. A7	14.85
Youngstown C8	14.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	10.00
Dearborn,Mich. D3	10.10
Dover,O. G6	10.10
Ecorse,Mich. G5	10.10
Ind.Harbor,Ind. Y1	10.20
Lackawanna,N.Y. B2	9.10
Sharon,Pa. S3	10.00

STRIP, Cold-Finished Spring Steel (Annealed)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	8.50	10.10	12.90	15.30	18.25
Boston T6	8.50	10.10	12.90	15.30	18.25
Bristol,Conn. W1	...	...	12.90	15.30	18.25
Carnegie,Pa. S18	...	9.80	12.60	15.00	...
Cleveland A7	7.95	9.80	12.60	15.00	17.95
Cleveland C7	...	9.80	12.60	15.00	17.95
Dover,O. G6	7.95	9.80	12.60	15.00	17.95
Detroit, D2	8.05	9.90	12.70	15.10	...
Dearborn,Mich. D3	8.05	9.90	12.70	...	...
FranklinPark,Ill. T6	8.05	9.80	12.60	15.00	17.95
Harrison,N.J. C18	...	...	12.90	15.30	18.25
Indianapolis C8	8.10	9.95	12.60	15.00	17.95
NewBritain Conn.(10) S15	7.95	9.80	12.60	15.00	17.95
NewCastle,Pa. B4, E5	7.95	9.80	12.60	15.00	...
NewHaven,Conn. D2	8.40	10.10	12.90	15.30	...
NewKensington,Pa. A6	7.95	9.80	12.60	15.00	...
NewYork W3	...	10.10	12.90	15.30	18.25
Pawtucket,R.I. N8	8.50	10.10	12.90	15.30	18.25
Riverdale,Ill. A1	8.05	9.80	12.60	15.00	17.95
Rome,N.Y. (32) R6	7.95	9.80	12.60	15.00	17.95
Sharon,Pa. S3	7.95	9.80	12.60	15.00	17.95
Trenton,N.J. R5	...	10.10	12.90	15.30	18.25
Wallingford,Conn. W2	8.40	10.10	12.90	15.30	18.15
Warren,O. T5	7.95	9.80	12.60	15.00	17.95
Weirton,W.Va. W6	7.95	9.80	12.60	15.00	17.95
Worcester,Mass. A7, T6	8.50	10.10	12.90	15.30	18.25
Youngstown C8	7.95	9.80	12.60	15.00	17.95

Spring Steel (Tempered)			Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	...	...	16.80	20.65	...
Buffalo W12	...	...	16.80	...	...
FranklinPark,Ill. T6	...	...	17.15	21.00	25.35
Harrison,N.J. C18	...	...	16.80	20.65	25.00
NewYork W3	...	...	16.80	20.65	25.00
Palmer,Mass. W12	...	...	16.80	...	...
Trenton,N.J. R5	...	...	16.80	20.65	25.00
Worcester,Mass. W12	...	...	14.80	...	...
Worcester,Mass. A7, T6	...	...	16.80	20.65	25.00
Youngstown C8	...	...	17.15	21.00	25.35

SILICON STEEL

H.R. SHEETS (22 Ga., cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	...	...	11.00	12.05	13.05
Brackenridge,Pa. A4	...	...	11.00	12.05	13.05
Mansfield,O. E6	9.20	10.35	11.00	12.05	13.05
Newport,Ky. N9	9.20	10.35	11.00	12.05	13.05
Niles,O. M21	9.20	10.35	11.00	12.05	...
Vandergrift,Pa. U5	...	10.35	11.00	12.05	13.05
Warren,O. R2	9.20	10.35	11.00	12.05	...
Zanesville,O. A10	...	10.35	11.00	12.05	13.05
Zanesville A10 (FP coils)	...	10.85	11.525	12.575	13.55
Zanesville A10 (SP coils)	...	...	11.025	12.075	13.05

C.R. COILS & CUT LENGTHS, (22 Ga.) Fully Processed (Semiprocessed ½¢ lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge,Pa. A4	...	...	11.525	12.575	13.55
GraniteCity,Ill. G4	9.40*	10.55*	11.225*	12.275*	...
IndianaHarbor,Ind. I-2	9.20†	10.35*	11.025*	12.075*	...
Mansfield,O. E6	9.70	10.85	11.525	12.575	13.55
Vandergrift,Pa. U5	9.20*	10.35*	11.025*	12.075*	13.05*
Vandergrift,Pa. U5	...	10.85†	11.525†	12.575†	13.55†
Warren,O. R2	9.20*	10.85	11.525	12.575	13.55

H.R. SHEETS (22 Ga., cut lengths)	Transformer Grade T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	14.05	14.60	15.10	16.15
Brackenridge,Pa. A4	14.05	...	...	...
Vandergrift,Pa. U5	14.05	14.60	15.10	16.15
Zanesville,O. A10	14.05	14.60	15.10	16.15

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	16.90	18.50	19.00	19.50	14.05**	
Butler Pa. A10	...	18.50	19.00	19.50	...	
Vandergrift,Pa. U5	15.90	16.90	18.50	19.00	19.50	14.55**
Warren,O. R2	...	...	...	...	...	14.55‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½¢ lower. **Cut lengths, ¾-cent lower.

SparrowsPoint,Md. B2	9.10
Warren,O. R2	10.00
Weirton,W.Va. W6	10.20
Youngstown Y1	10.20

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2	7.60

STRIP, Electrogalvanized

Cleveland A7	6.85*
Dover,O. G6	6.85*
Riverdale,Ill. A1	6.95*
Warren,O. B9, T5	6.85*
Worcester,Mass. A7	7.40*
Youngstown C8	6.85*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	6.975

TIGHT COOPERAGE HOOP

Atlanta A11	5.40
Riverdale,Ill. A1	5.25
Sharon,Pa. S3	5.10
Youngstown U5	5.10

TIN MILL PRODUCTS

TIN PLATE Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$8.30	$8.55	$8.95
Dravosburg,Pa. U5	8.30	8.55	8.95
Fairfield,Ala. T2	8.40	8.65	9.05
Fairless,Pa. U5	8.40	8.65	9.05
Fontana,Calif. K1	9.05	9.30	9.70
Gary,Ind. U5	8.30	8.55	8.95
GraniteCity,Ill. G4	8.40	8.65	9.05
IndianaHarbor,Ind. I-2, Y1	8.30	8.55	8.95
Niles,O. R2	8.30	8.55	8.95
Pittsburg,Calif. C11	9.05	9.30	9.70
SparrowsPoint,Md. B2	8.40	8.65	9.05
Weirton,W.Va. W6	8.30	8.55	8.95
Yorkville,O. W10	8.30	8.55	8.95

ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	6.975	...	...
Niles,O. R2	6.975	7.175	7.375

TINPLATE, American	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$9.60	$9.85
Dravosburg,Pa. U5	9.60	9.85
Fairfield,Ala. T2	9.70	9.95
Fairless,Pa. U5	9.70	9.95
Fontana,Calif. K1	10.35	10.60
Gary,Ind. U5	9.60	9.85
Ind.Harbor Y1	9.60	9.85
Pitts.,Calif. C11	10.35	10.60
Sp.Pt.,Md. B2	9.70	9.95
Weirton,W.Va. W6	9.60	9.85
Yorkville,O. W10	9.60	9.85

BLACK PLATE (Base Box)	
Aliquippa,Pa. J5	$7.40
Dravosburg,Pa. U5	7.40
Fairfield,Ala. T2	7.50
Fairless,Pa. U5	7.50
Fontana,Calif. K1	8.15
Gary,Ind. U5	7.40
GraniteCity,Ill. G4	7.50
Ind.Harbor,Ind. I-2, Y1	7.40
Niles,O. R2	7.40
Pittsburg,Calif. C11	8.15

SparrowsPoint Md. B2	7.50
Weirton,W.Va. W6	7.40
Yorkville,O. W10	7.40

HOLLOWARE ENAMELING Black Plate (29 Gage)

Dravosburg,Pa. U5	$7.15
Gary,Ind. U5	7.15
GraniteCity,Ill. G4	7.25
Ind.Harbor,Ind. Y1	7.15
Yorkville,O. W10	7.15

MANUFACTURING TERNES (Special Coated; Base Box)

Dravosburg,Pa. U5	$9.10
Gary,Ind. U5	9.10
Yorkville,O. W10	9.10

MANUFACTURING TERNES (Light Coated, 6 lb; Base Box)

Yorkville,O. W10	$9.55

ROOFING SHORT TERNES (8 lb Coated; Base Box)

Gary,Ind. U5	$10.65

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	7.20
Aliquippa,Pa. J5	7.20
Alton,Ill. L1	7.40
Atlanta A11	7.40
Bartonville,Ill. K4	7.30
Buffalo W12	7.20
Chicago W13	7.20
Cleveland A7, C20	7.20
Crawfordsville,Ind. M8	7.30
Donora,Pa. A7	7.20
Duluth,Minn. A7	7.20
Fairfield,Ala. T2	7.20
Fostoria O.(24) S1	7.30
Houston S5	7.45
Jacksonville,Fla. M8	7.55
Johnstown,Pa. B2	7.20
Joliet,Ill. A7	7.20
KansasCity,Mo. S5	7.45
Kokomo,Ind. C16	7.30
LosAngeles B3	8.15
Minnequa,Colo. C10	7.45
Monessen,Pa. P7, P16	7.20
N.Tonawanda B11	7.20
Palmer,Mass. W12	7.50
Pittsburg,Calif. C11	8.15
Portsmouth,O. P12	7.20
Rankin,Pa. A7	7.20
S.Chicago,Ill. R2	7.20
S.SanFrancisco C10	8.15
SparrowsPoint,Md. B2	7.30
Sterling,Ill.(1) N15	7.20
Sterling,Ill. N15	7.30
Struthers,O. Y1	7.20
Waukegan Ill. A7	7.20
Worcester,Mass. A7	7.50

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	8.725
Alton,Ill. L1	8.925
Bartonville Ill. K4	8.825
Buffalo W12	8.725
Cleveland A7	8.725
Donora,Pa. A7	8.725
Duluth,Minn. A7	8.725
Fostoria,O. S1	8.775
Johnstown,Pa. B2	8.725
LosAngeles B3	9.675
Milbury,Mass.(12) N6	9.025
Minnequa,Colo. C10	8.975
Monessen,Pa. P7, P16	8.725
Muncie,Ind. I-7	8.925
Palmer,Mass. W12	9.025
Pittsburg Calif. C11	9.675
Portsmouth,O. P12	8.725
Roebling,N.J. R5	9.025
S.Chicago Ill. R2	8.725
S.SanFrancisco C10	9.675
SparrowsPt.,Md. B2	8.825
Struthers,O. Y1	8.725
Trenton,N.J. A7	9.025
Waukegan Ill. A7	8.725
Worcester J4	9.025
Worcester,Mass. A7, T6	9.025

WIRE, Upholstery Spring

Aliquippa,Pa. J5	8.40
Alton Ill. L1	8.60
Buffalo W12	8.40
Cleveland A7	8.40
Donora,Pa. A7	8.40
Duluth,Minn. A7	8.40
Johnstown,Pa. B2	8.40
KansasCity,Mo. S5	8.65
LosAngeles B3	9.35
Minnequa,Colo. C10	8.60
Monessen,Pa. P7, P16	8.40
NewHaven,Conn. A7	8.70
Palmer,Mass. W12	8.70
Pittsburg,Calif. C11	9.35
Portsmouth,O. P12	8.40
Roebling,N.J. R5	8.70
S.Chicago,Ill. R2	8.40
S.SanFrancisco C10	9.35
SparrowsPoint,Md. B2	8.50
Struthers,O. Y1	8.40
Trenton,N.J. A7	8.70
Waukegan,Ill. A7	8.40
Worcester,Mass. A7	8.70

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1	14.35
Bartonville,Ill. K4	14.25
Buffalo W12	14.15
Chicago W13	13.55
Cleveland A7	14.15
Crawfordsville,Ind. M8	14.25
Fostoria O. S1	14.15
Jacksonville,Fla. M8	14.50
Johnstown Pa. B2	14.15
Kokomo,Ind. C16	14.15
Minnequa,Colo. C10	13.90
Monessen,Pa. P6	14.15
Muncie,Ind. I-7	14.35
Palmer,Mass. W12	14.45
Roebling,N.J. C10	14.45
S.SanFrancisco C10	14.50
Waukegan,Ill. A7	14.15
Worcester,Mass. A7, T6	14.45

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	11.75
Buffalo W12	11.75
Johnstown,Pa. B2	11.75
Minnequa,Colo. C10	11.875
Monessen,Pa. P16	11.75
Muncie,Ind. I-7	11.95
Palmer,Mass. W12	12.05
Pittsburg Calif. C11	12.55
Portsmouth,O. P12	11.75
Roebling,N.J. R5	12.05
SparrowsPt.,Md. B2	11.85
Struthers O. Y1	11.75

ROPE WIRE	(A)
Bartonville,Ill. K4	11.55
Buffalo W12	11.55
Fostoria O. S1	11.55
Johnstown,Pa. B2	11.55
Monessen,Pa. P7, P16	11.55
Muncie,Ind. I-7	11.75
Palmer,Mass. W12	11.85
Portsmouth,O. P12	11.35
Roebling,N.J. R5	11.85
SparrowsPt. B2	11.65
Struthers,O. Y1	11.35
Worcester,Mass. J4	11.85

(A) Plow and Mild Plow; add 0.25c for Improved Plow

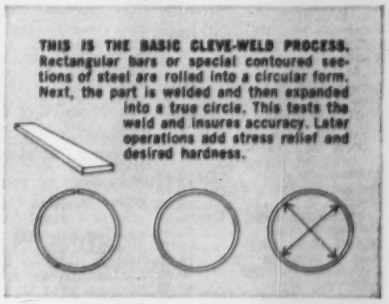
STRESS

can be a hidden enemy of circular parts like jet-engine rings. To insure physical and metallurgical accuracy, specify Cleve-Weld welded rings.

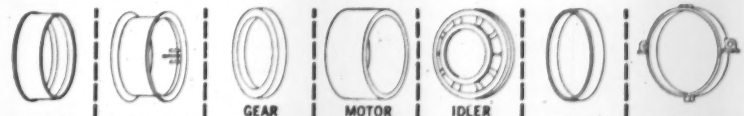
Top Jet-Engine makers specify Cleve-Weld rings

The *design, metallurgy* and *production* of welded circular parts have been Cleve-Weld specialties for 45 years. We've worked with materials from carbon to stainless and the latest aircraft alloy steels. Cleve-Weld has the specialized equipment and experience to do exacting jobs. These are the reasons why America's jet-engine makers procure Cleve-Weld rings. Pratt & Whitney J-57, Wright Aeronautical J-65, General Electric J-47 and other great jet engines testify to our ring accuracy.

Cleve-Weld is also a prime supplier of truck and tractor rims, rings, bands and gear blanks. *Make Cleve-Weld your primary source for all rolled and welded circular parts, too.* We'll show you why in dollars and cents. Write Circular Welded Products Sales Department below.


THIS IS THE BASIC CLEVE-WELD PROCESS. Rectangular bars or special contoured sections of steel are rolled into a circular form. Next, the part is welded and then expanded into a true circle. This tests the weld and insures accuracy. Later operations add stress relief and desired hardness.

EXAMPLES OF CLEVE-WELD PROCESS PRODUCTS



Another AMF Product
CLEVE-WELD PROCESS
RIMS · RINGS · WELDMENTS

CLEVELAND WELDING DIVISION
AMERICAN MACHINE & FOUNDRY COMPANY
Cleveland 11, Ohio

SEND THIS COUPON NOW

Cleveland Welding Division—Dept. ST-610
American Machine & Foundry Company
West 117th Street and Berea Road
Cleveland 11, Ohio

Please send me:

- ☐ Truck Rim Catalog
- ☐ Tractor Rim Catalog
- ☐ Brochure on Cleve-Weld Process

Name_____

Title_____

Attach to your company letterhead and mail

WIRE

WIRE, Tire Bead

Bartonville,Ill. K4	....15.25
Monessen,Pa. P16	....14.45
Roebling,N.J. R5	....14.35

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	.....10.75
Baltimore T6	.....11.05
Boston T6	.....11.05
Buffalo W12	.....10.75
Cleveland A7	.....10.75
Crawfordsville,Ind. M8	10.75
Dover,O. G6	.....10.75
Fostoria,O. S1	.....10.75
FranklinPark,Ill. T6	...10.85
Kokomo,Ind. C16	....10.75
Massillon,O. R8	.....10.75
Milwaukee C23	.....10.95
Monessen,Pa. P7, P16	.10.75
NewKensington,Pa. A6	.10.75
Palmer,Mass. W12	....11.05
Pawtucket,R.I. N8	....11.05
Riverdale,Ill. A1	.....10.85
Rome,N.Y. R6	.....10.75
Trenton,N.J. R5	.....11.05
Worcester A7, T6	....11.05

NAILS, Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	...167
Aliquippa,Pa. J5	167
Atlanta A11	169
Bartonville,Ill. K4	169
Chicago,Ill. W13	167
Cleveland A9	173
Crawfordsville,Ind. M8	.169
Donora,Pa. A7	167
Duluth,Minn. A7	167
Fairfield,Ala. T2	167
Houston,Tex. S5	172
Jack'ville,Fla.(20) M8	..178
Johnstown,Pa. B2	169
Joliet,Ill. A7	167
KansasCity,Mo. S5	172
Kokomo,Ind. C16	169
Minnequa,Colo. C10	172
Monessen,Pa. P7	167
Pittsburg,Calif. C11	186
Rankin,Pa. A7	167
S.Chicago,Ill. R2	167
SparrowsPt.,Md. B2	169
Sterling,Ill.(1) N15	167
Worcester,Mass. A7	173

(To Wholesalers; per cwt)

Galveston,Tex. D7 ....$8.75

NAILS, Cut (100 lb keg)

To Dealers (33)	
Conshohocken,Pa. A3	..$9.80
Wheeling,W.Va. W10	..9.80

STAPLES, Polished Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	.167
Aliquippa,Pa. J5	167
Atlanta A11	169
Bartonville,Ill. K4	169
Crawfordsville,Ind. M8	..169
Donora,Pa. A7	167
Duluth,Minn. A7	167
Fairfield,Ala. T2	167
Jack'ville,Fla.(20) M8	..178
Johnstown,Pa. B2	169
Joliet,Ill. A7	167
Kokomo,Ind. C16	169
Minnequa,Colo. C10	172
Monessen,Pa. P7	167
Pittsburg,Calif. C11	186
Rankin,Pa. A7	167
S.Chicago,Ill. R2	167
SparrowsPt.,Md. B2	169
Sterling,Ill.(1) N15	167
Worcester,Mass. A7	173

TIE WIRE, Automatic Baler (14½ Ga.) (Per 97 lb Net Box)

Coil No. 3150	
AlabamaCity,Ala.	R2.$10.03
Bartonville,Ill. K4	.....10.13
Buffalo W12	.....10.05
Crawfordsville,Ind.	M8.10.13
Donora,Pa. A7	.....10.03
Duluth,Minn. A7	.....10.03
Jacksonville,Fla.	M8 ..10.58
Johnstown,Pa. B2	....10.03
Joliet,Ill. A7	.....10.03
Kokomo,Ind. C16	.....10.13
LosAngeles B3	.....10.82
Minnequa,Colo. C10	....10.28
Pittsburg,Calif. C11	...10.81
S.Chicago,Ill. R2	.....10.03
S.SanFrancisco C10	....10.81
SparrowsPt.,Md. B2	....10.13
Sterling,Ill. N15	.....10.03

Coil No. 6500 Stand.	
AlabamaCity,Ala.	R2 .$10.35
Bartonville,Ill. K4	....10.45
Buffalo W12	.....10.35
Crawfordsville,Ind.	M8 10.45
Donora,Pa. A7	.....10.35
Duluth,Minn. A7	.....10.35
Jacksonville,Fla.	M8 ...10.91
Johnstown,Pa. B2	....10.35
Joliet,Ill. A7	.....10.35
Kokomo,Ind. C16	.....10.45
LosAngeles B3	.....11.15
Minnequa,Colo. C10	....10.60
Pittsburg,Calif. C11	...11.15
S.Chicago,Ill. R2	....10.35
S.SanFrancisco C10	....11.15
SparrowsPt.,Md. B2	....10.45
Sterling,Ill. N15	.....10.35

Coil Interim

AlabamaCity,Ala.	R2 .$10.40
Bartonville,Ill. K4	....10.50
Buffalo W12	.....10.40
Crawfordsville,Ind.	M8 10.50
Donora,Pa. A7	.....10.40
Duluth,Minn. A7	.....10.40
Jacksonville,Fla.	M8 ..10.96
Johnstown,Pa. B2	....10.40
Joliet,Ill. A7	.....10.40
Kokomo,Ind. C16	....10.50
LosAngeles B3	.....11.34
Minnequa,Colo. C10	..10.65
Pittsburg,Calif. C11	...11.20
S.Chicago,Ill. R2	....10.40
S.SanFrancisco C10	....11.20
SparrowsPt.,Md. B2	....10.50
Sterling,Ill. N15	.....10.40

WIRE, Barbed — Col.

AlabamaCity,Ala. R2	.187**
Aliquippa,Pa. J5	.....184‡
Atlanta A11	193
Bartonville,Ill. K4	193
Crawfordsville,Ind. M8	..193
Donora,Pa. A7	.....187†
Duluth,Minn. A7	.....187†
Fairfield,Ala. T2	.....187†
Houston,Tex. S5	.....192**
Jacksonville,Fla. M8	...198
Johnstown,Pa. B2	.....191*
Joliet,Ill. A7	.....187†
KansasCity,Mo. S5	.....192**
Kokomo,Ind. C16	.....189†
Minnequa,Colo. C10	..192**
Monessen,Pa. P7	.....191*
Pittsburg,Calif. C11	....207†
Rankin,Pa. A7	.....187†
S.Chicago,Ill. R2	.....187**
S.SanFrancisco C10	....207**
SparrowsPoint,Md. B2	.193*
Sterling,Ill.(1) N15	.....191*

WOVEN FENCE, 9-15 Ga. — Col.

Ala.City,Ala. R2	.....181**
Aliq'ppa,Pa. 9-14½ga. J5	184‡
Atlanta A11	187
Bartonville,Ill. K4	187
Crawfordsville,Ind. M8	..187
Donora,Pa. A7	.....181†
Duluth,Minn. A7	.....181†
Fairfield,Ala. T2	.....181†
Houston,Tex. S5	....186**
Jacksonville,Fla. M8	192
Johnstown,Pa.(43) B2	..185
Joliet,Ill. A7	.....181†
KansasCity,Mo. S5	....186**
Kokomo,Ind. C16	.....183†
Minnequa,Colo. C10	....186**
Monessen,Pa. 9 ga. P7	185*
Pittsburg,Calif. C11	....204†
Rankin,Pa. A7	.....181†
S.Chicago,Ill. R2	.....181**
Sterling,Ill.(1) N15	.....185*

WIRE (16 Gage)	An'ld Galv. Stone	Stone
Ala.City,Ala.	R2 16.10	17.65**
Bartonville	K4 ..16.10	18.05
Buffalo	W12 ....16.10	....
Cleveland	A7 ....16.10	....
Crawf'dsville	M8 16.20	18.15
Fostoria,O.	S1 ..16.20	17.75†
Jacksonville	M8..16.45	18.40
Johnstown	B2 ..16.10	18.05*
Kokomo	C16 ..16.20	17.75†
Minnequa	C10 .16.45	18.15**
P'lm'r,Mass.	W12 16.10	17.65*
Pitts.,Calif.	C11..16.45	18.00†
SparrowsPt.	B2.16.20	18.15*
Sterling(1)	N15 16.10	18.05*
Waukegan	A7 ..16.10	17.65
Worcester	A7....16.40	....

WIRE, Merchant Quality

(6 to 8 gage)	An'ld Galv.
Ala.City,Ala.	R2.8.10 8.50**
Aliquippa	J5 ....8.10 8.625‡
Atlanta	A11 ....8.20 8.80
Bartonville(48)	K4.8.20 8.80
Buffalo	W12 ....8.10 8.50†
Cleveland	A7 .....8.10 ....
Crawfordsville	M8 .8.20 8.80
Donora,Pa.	A7 ...8.10 8.50†
Duluth,Minn.	A7 ..8.10 8.50†
Fairfield	T2 ....8.10 8.50†
Houston(48)	S5 ..8.35 8.75**
Jacks'ville,Fla.	M8.8.45 9.05
Johnstown B2(48)	8.10 8.70*
Joliet,Ill.	A7 ....8.10 8.50†
Kans.City(48)	S5.8.35 8.75**
Kokomo	C16 ....8.20 8.60†
LosAngeles	B3 ...9.05 9.65†
Minnequa	C10 ..8.35 8.75**
Monessen P7 (48)	8.10 8.70*
Palmer,Mass.	W12 8.40 8.80†
Pitts.,Calif.	C11 ...9.05 9.45†
Portsmouth,O.	P12 8.10 ....
Rankin,Pa.	A7 ..8.10 8.50†
S.Chicago	R2 ....8.10 8.50**
S.SanFran.	C10 ..9.05 9.45**
Spar'wsPt.	B2(48) .8.20 8.80*
Sterling(1)(48)	N15 8.10 8.70*
Struth'rs,O.(48)	Y1 8.10 8.60‡
Worcester,Mass.	A7 8.40 8.80†

Based on zinc price of: *13.50c. †5c. ‡10c. §Less than 10c. ††13c. **Subject to zinc equalization extras.

BALE TIES, Single Loop — Col.

AlabamaCity,Ala. R2	195
Atlanta A11	197
Bartonville,Ill. K4	197
Crawfordsville,Ind. M8	..197
Donora,Pa. A7	195
Duluth,Minn. A7	195
Fairfield,Ala. T2	195
Jacksonville,Fla. M8	...202
Joliet,Ill. A7	195
Houston S5	200
KansasCity,Mo. S5	200
Kokomo,Ind. C16	197
Minnequa,Colo. C10	200
Pitts.,Calif. C11	199
S.Chicago,Ill. R2	167
Sterling,Ill. N15	167
Tonawanda,N.Y. B12	...169
Williamsport,Pa. S19	...175

FENCE POSTS

ChicagoHts.,Ill. C2, I-2.	.167
Duluth,Minn. A7	167
Franklin,Pa. F5	167
Huntington,W.Va. W7	...169
Johnstown,Pa. B2	167
Marion,O. P11	157
Minnequa,Colo. C10	172
Moline,Ill. R2	172
S.Chicago,Ill. R2	167
Sterling,Ill. N15	167
Tonawanda,N.Y. B12	...169
Williamsport,Pa. S19	175

FASTENERS

(Base discounts, full container quantity, per cent off list, f.o.b. mill)

BOLTS

Carriage, Machine Bolts
Full Size Body (cut thread)
½ in. and smaller:
6 in. and shorter 55
Longer than 6 in. .. 46.5
⅞ in. thru 1 in.:
6 in. and shorter 46.5
Longer than 6 in. .. 44
1⅛ in. and larger:
All lengths 44
Undersized Body (rolled thread)
½ in. and smaller:
6 in. and shorter .. 55

Carriage, Machine Lag Bolts
Hot Galvanized:
½ in. and smaller:
6 in. and shorter ... 35
Longer than 6 in. .. 23
⅞ in. thru 1 in.:
6 in. and shorter ... 20
Longer than 6 in. .. 20
1⅛ in. and larger:
All lengths 20

Lag Bolts
All diameters:
6 in. and shorter 55
Longer than 6 in. 47

Plow and Tap Bolts
½ in. and smaller by 6 in. and shorter 54
Larger than ½ in. or longer than 6 in. 47
Blank Bolts 44
Step, Elevator, Tire Bolts 54

NUTS

Reg. & Heavy Square Nuts:
All sizes 59

Square Nuts, Reg. & ..
Heavy, Hot Galvanized: ....
All sizes 45

Hex Nuts, Reg. & Heavy, Hot Pressed:
⅝ in. and smaller .. 63
⅞ in. to 1 in. incl. 59.5
1⅛ in. to 1½ in., incl. 64
1⅝ in. and larger .. 58

Hex Nuts, Reg. & Heavy, Cold Punched:
⅝ in. and smaller.. 63
⅞ in. to 1½ in., incl. 59.5
1⅝ in. and larger.. 58

Hex Nuts, All Types, Hot Galvanized:
⅝ in. and smaller.. 50
⅞ in. to 1 in., incl. 46
1⅛ in. to 1½ in., incl. 51

Hex Nuts, Semifinished, Reg. & Heavy (Incl. slotted):
⅝ in. and smaller.. 63
⅞ in. to 1½ in., incl. 59.5
1⅝ in. and larger.. 58

Hex Nuts, Finished (Incl. Slotted and Castellated):
1 in. and smaller... 65
1⅛ in. to 1⅜ in., incl. 62
1⅝ in. and larger.. 58
(Base discounts, packages, per cent off list, f.o.b. mill)

CAP AND SET SCREWS

Hex Head Cap Screws, Coarse or Fine Thread Bright:
6 in. and shorter:
⅝ in. and smaller.. 47
¾, ⅞, and 1 in., diam. 31
Longer than 6 in.:
⅝ in. and smaller.. 18.5
¾, ⅞ and 1 in. diam. 55

High Carbon, Heat Treated:
6 in. and shorter:
⅝ in. and smaller.. 34
¾, ⅞ and 1 in. diam. 13
Longer than 6 in.:
⅝ in. and smaller... +1
¾, ⅞ and 1 in. diam. ..... +19

Fillister Head, Coarse Thread:
Listed Sizes ..... +31

Flat Head, Coarse Head:
⅛ in. and smaller by 6 in. and shorter.. +57

Set Screws, Square Head, Cup Point, Coarse Thread:
Through 1 in. diam.:
6 in. and shorter .. 11
Longer than 6 in. ..+10

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago, and/or freight equalized with Birmingham except where equalization is too great.
Structural ½-in., larger 10.85
7/16-in. under List less 26.5%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	23.56	22.84
1¼	13	....	27.92	22.68
1½	13	26.34	30.86	25.08
1¾	13	31.12	36.45	29.64
2	13	34.88	40.85	33.21
2¼	13	39.29	46.01	37.42
2½	12	42.64	49.94	40.61
2¾	12	46.98	55.01	44.73
2¾	12	50.86	59.57	48.44
3	12	54.24	63.53	51.66

RAILWAY MATERIALS

	Standard No. 1	Standard No. 2	Tee Rails All No. 2	Tee Rails 60 lb Under
RAILS				
Bessemer,Pa. U5	5.075	4.975	5.025	6.00
Ensley,Ala. T2	5.075	4.975	....	6.00
Fairfield,Ala. T2	....	....	....	6.00
Gary,Ind. U5	5.075	4.975	5.025	...
Huntington,W.Va. W7	....	....	....	6.15
IndianaHarbor,Ind. I-2	5.075	4.975	5.025	...
Johnstown,Pa. B2	....	....	...(16)	6.00
Lackawanna,N.Y. B2	5.075	4.975	...(16)	6.00
Minnequa,Colo. C10	5.075	4.975	....	6.50
Steelton,Pa. B2	5.075	4.975	....	...
Williamsport,Pa. S19	....	....	....	6.15

TIE PLATES

Fairfield,Ala. T2	.....6.025
Gary,Ind. U5	.....6.025
Ind.Harbor,Ind I-2	...6.025
Lackawanna,N.Y. B2	..6.025
Minnequa Colo. C10	...6.025
Seattle B3	.....6.175
Steelton,Pa. B2	.....6.025
Torrance,Calif. C11	...6.175

TRACK BOLTS, Untreated

Cleveland R2	.....13.10
Lebanon,Pa. B2	.....13.10
Minnequa,Colo. C10	....13.10
Pittsburgh P14	.....13.10
Seattle B3	.....13.60

AXLES

Ind.Harbor,Ind. S13	....8.10
Johnstown,Pa. B2	....8.10

JOINT BARS

Bessemer,Pa. U5	.....6.35
Fairfield, Ala. T2	.....6.35
Ind.Harbor,Ind. I-2	....6.35
Joliet,Ill. U5	.....6.35
Lackawanna,N.Y. B2	..6.35
Minnequa,Colo. C10	...6.35
Steelton,Pa. B2	.....6.35

SCREW SPIKES

Cleveland R2	.....12.85
Pittsburgh P14	.....12.85

STANDARD TRACK SPIKES

Fairfield,Ala. T2	....8.775
Ind.Harbor,Ind. I-2, Y1	8.775
KansasCity,Mo. S5	....8.775
Lebanon,Pa. B2	.....8.775
Minnequa Colo. C10	...8.775
Pittsburgh J5	.....8.775
Seattle B3	.....9.275
S.Chicago,Ill. R2	.....8.775
Struthers,O. Y1	.....8.775
Youngstown R2	.....8.775

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1½ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in., 6.23c; 1 15/16 to 8 in., inclusive, 6.60c.
(6) Chicago or Birm. base.
(7) To jobbers, 3 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.349 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅝" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(20) Plus 1c per 100 lb.
(21) New Haven, Conn., base.
(22) Deld. San Francisco Bay area.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.685c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝-in.; 7.50c, for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.80c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(38) 14 Ga. & Lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.685c.
(43) 9-14½ Ga.
(48) 6-7 Ga.
(49) 3½-in. and smaller rounds; 8.65c, over 3½-in. and other shapes.

KARDONG FOUR-WAY BENDER

For Concrete Reinforcing Bars

Model D-2

The Model D-2 Kardong Bender is a Four Direction Horizontal Bender. With this bender it is not necessary to turn bars over to make reverse or second bends on beam bars. The Model D-2 is made in two sizes, Model D-2 Standard 6-inch, which will bend bars around collars 2-inch to 6-inch, and Model D-2 Special 8-inch, which will bend bars around collars 2-inch to 8-inch. Capacity of both models, 1¼-inch Square Bars. The Model D-2 is a production bender for reinforcing steel fabricating shop. Ask for catalog of our complete line of reinforcing bar benders.

KARDONG BROTHERS, INC.

MINNEAPOLIS 13, MINN.

FORGINGS

HAMMERED STEEL FORGINGS

up to 6,000 lbs. each

ALL TYPES

Smooth Forged Finished — Rough Turned Hollow Bored

and Heat Treated to Specifications

CRANKSHAFTS, CONNECTING RODS, SHAFTING

Roll—Gear Blanks—Pinions and Miscellaneous Forgings

BAY CITY FORGE CO.

ERIE, PA.

Over a Quarter of a Century of Dependable Service and Quality Products

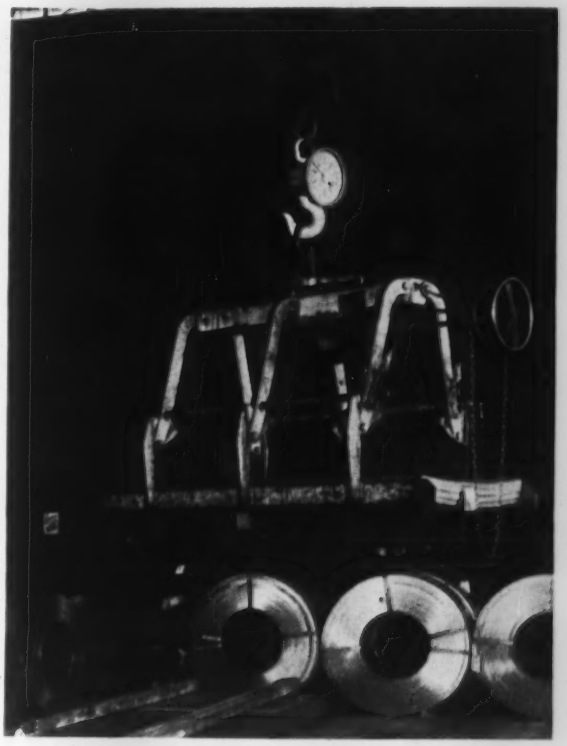
If

METALWORKING PLANTS ARE YOUR PROSPECTS . . .

✔ STEEL can put you in touch with the important ones, those that do more

✔ than 92% of the industry's business.

✔ Tell the buyers and specifiers in these plants of the machines or materials you have for sale through an "Equipment—Materials" advertisement. For rates write STEEL, Penton Building, Cleveland 13, Ohio.



HOW TO INVENTORY A STEEL COMPANY WAREHOUSE

The easy way

This steel warehouse made the not-too-startling discovery that the simplest way to take a physical inventory is to lift each roll or package of steel a short distance off the floor, weigh it with a Martin-Decker SU-20 Sensater hook scale, and then set it back down in place. The amazing thing is the number of companies that continue to take inventory by the tedious, old-fashioned method of moving the entire contents of warehouse, one piece at a time, to a platform scale, and then returning it to the original locations by the same laborious process, when they could use the simple, weigh-it-in-place Sensater method at a fraction of the time and cost.

This is but one of the hundreds of uses for the versatile Sensater, the only hydraulic crane scale accurate enough to be certified, yet rugged and compact enough to meet industry's exacting demands.

For full particulars, write Martin-Decker Corp., 3431 Cherry Ave., Long Beach 7, Calif., Dept. AJ-15.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8
Ambridge, Pa. N2	+2	....	4.5	....	7	....	8.5	....	8.5	....	8.25	....	10.75	....
Lorain, O. N3	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8
Youngstown Y1	0.5	+17.5	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Alton, Ill. L1	....	....	....	....	....	....	10.5	+3.75	13.5	+4.75	16	+1.25	18.5	0.5
Benwood, W. Va. W10	10	+20.5	+0.25	+27.75	+9.75	+37.25	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Butler, Pa. P6	10	+20.5	0.5	+27	+8.5	+36	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Fairless, Pa. N3	....	....	....	....	....	....	10.5	+8.75	13.5	+4.75	16	+1.25	18.5	0.5
Fontana, Calif. K1	....	....	....	....	....	....	0	+19.25	3	+15.25	5.5	+11.75	8	+10
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	11.5	+7.75	14.5	+3.75	17	+0.25	19.5	1.5
Lorain O. N3	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Sharon, Pa. S4	11	+19.5	1.5	+26	+7.5	+35	....	....	....	....	....	....	....	....
Sharon Pa. M6	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Sparrows Pt., Md. B2	16	+12.5	7.5	+18	+0.5	+25	16.5	+0.75	19.5	3.25	22	6.75	24.5	8
Wheatland, Pa. W9	18	+12.5	9.5	+18	1.5	+26	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Youngstown R2, Y1	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Alton, Ill. L1	19	1.5	19.5	2	21	2.75	21	2.75	....	....	....	....
Benwood, W. Va. W10	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+0.75	13.5	+5.25
Etna, Pa. N2	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+5.25	13.5	+5.25
Fairless, Pa. N3	19	1.5	19.5	2	21	2.75	21	2.75	11.5	+7.25	11.5	+7.25
Fontana, Calif. K1	8.5	+9	9	+8.5	10.5	+7.75	10.5	+7.75	1	+17.75	1	+17.75
Indiana Harbor, Ind. Y1	20	2.5	20.5	3	22	3.75	22	3.75	12.5	+6.25	12.5	+6.25
Lorain, O. N3	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Sharon, Pa. M6	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Sparrows Pt., Md. B2	25	9	25.5	9.5	27	9.75	27	9.75	17.5	+0.25	17.5	+0.25
Wheatland, Pa. W9	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Youngstown R2, Y1	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+5.25	13.5	+5.25

*Galvanized pipe discounts based on current price of zinc (13.50c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	Rerolling Ingot	Rerolling Slabs	Forging Billets	Seamless Tube Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	19.75	24.50	....	....	33.00	....	....	....	45.00	41.50
202	21.00	27.25	33.00	....	35.75	....	39.25	41.25	45.25	45.25
301	20.50	25.25	33.75	....	34.00	38.50	40.50	42.50	47.25	43.75
302	22.00	28.00	34.00	....	36.75	38.75	40.75	43.00	47.50	47.50
302B	21.75	28.25	35.25	....	40.25	38.75	40.75	43.00	50.00	50.00
303	....	28.50	37.00	....	....	41.75	43.75	45.50	52.00	52.00
304	23.25	29.25	36.00	....	39.75	41.00	43.00	45.75	50.25	50.25
304L	....	....	43.00	....	46.75	48.50	50.50	53.25	57.75	57.75
305	24.75	32.50	37.75	....	43.00	41.00	43.00	46.25	53.50	53.50
308	26.75	34.00	42.50	....	45.50	48.25	50.50	55.00	57.50	57.50
309	34.75	44.00	51.50	....	58.50	57.75	60.50	64.25	73.50	73.50
310	42.50	53.75	69.00	....	75.50	77.75	81.50	83.25	87.00	87.00
314	....	....	....	....	....	77.75	....	83.25	....	....
316	35.25	44.50	56.25	....	63.50	63.75	66.75	70.25	74.75	74.75
316L	....	....	62.75	....	70.00	71.25	74.25	77.75	82.25	82.25
317	43.00	54.50	70.00	....	81.50	79.75	83.50	86.25	93.25	93.25
321	28.25	35.75	42.25	....	48.75	48.00	50.25	54.50	60.00	60.00
18-8CbTa	32.75	42.00	50.25	....	58.25	56.25	59.00	63.75	73.00	73.00
403	....	....	30.75	....	....	34.50	36.25	38.75	46.50	46.50
405	18.75	24.50	28.50	....	34.50	32.50	34.00	36.00	45.00	45.00
410	16.00	20.75	27.25	....	29.75	31.00	32.50	33.75	38.75	38.75
416	....	....	27.75	....	....	31.50	33.00	34.75	46.50	46.50
420	....	32.25	33.00	....	40.25	38.00	39.75	43.50	59.50	59.50
430	16.25	21.00	27.75	....	30.75	31.50	33.00	34.50	39.25	39.25
430F	....	....	28.25	....	....	32.00	33.50	35.25	49.75	49.75
431	....	27.25	35.50	....	....	39.75	41.75	43.50	53.00	53.00
446	....	....	37.75	....	56.75	42.75	44.75	46.00	67.25	80.00

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Div., H. K. Porter Co. Inc.; Alloy Tube Div. Carpenter Steel Co.; American Steel & Wire Div., U.S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Elwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McInnes Steel Co.; McLouth Steel Corp.; Metal Forming Corp.; National-Standard Co.; National Tube Div., U.S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Rotary Electric Steel Co.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Superior Steel Corp.; Superior Tube Co.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

	Plates 5%	Plates Carbon Base 10%	Plates Carbon Base 15%	Plates Carbon Base 20%	Sheets Carbon Base 20%
Stainless					
302	....	....	....	....	33.25
304	....	34.50	....	41.50	35.25
304-L	....	37.20	....	44.65	....
316	....	38.70	....	46.65	52.25
316-L	....	45.70	....	54.35	....
316-CB	....	45.90	....	54.75	....
321	....	36.35	....	43.40	42.00
347	....	39.50	....	48.45	51.00
405	....	29.20	....	37.05	....
410	....	28.70	....	36.55	....
430	....	28.70	....	36.55	....
Inconel	*45.70*	*54.80*	*63.85*	*73.00*	....
Nickel	*37.95*	*46.25*	*54.60*	*62.95*	....
Nickel, Low Carbon	*38.25*	*46.90*	*55.60*	*64.40*	....
Monel	*40.30*	*49.10*	*57.95*	*66.80*	....
Copper*	....	....	....	....	46.00

	Strip, Carbon Base—Cold Rolled— 10%	Strip, Carbon Base—Cold Rolled— Both Sides
Copper*	33.60	41.40

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4 and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

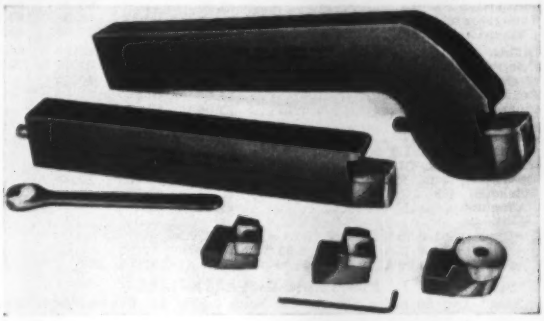
Tool Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.290	Cr Hot Work	0.45-0.495
Extra Carbon	0.345	W-Cr Hot Work	0.043-0.475
Special Carbon	0.41-0.45	V-Cr Hot Work	0.460
Oil Hardening	0.450	Hi-Carbon-Cr	0.830

Grade by Analysis (%) W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	....	4.170
18.25	4.25	1	4.75	....	2.385
18	4	2	9	....	2.7575
18	4	2	....	....	1.845
18	4	1	....	....	1.680
9	3.5	..	....	....	1.275
13.5	4	3	....	....	1.945
13.75	3.75	2	5	....	2.325
6.4	4.5	1.9	....	5	1.185
6	4	3	....	6	1.430
1.5	4	1	....	8.5	1.040

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, F2, J3, M14, S8, U4, V2, and V3.

PRODUCTION TOOLS BY APEX



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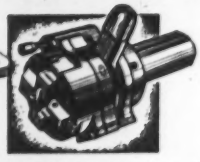

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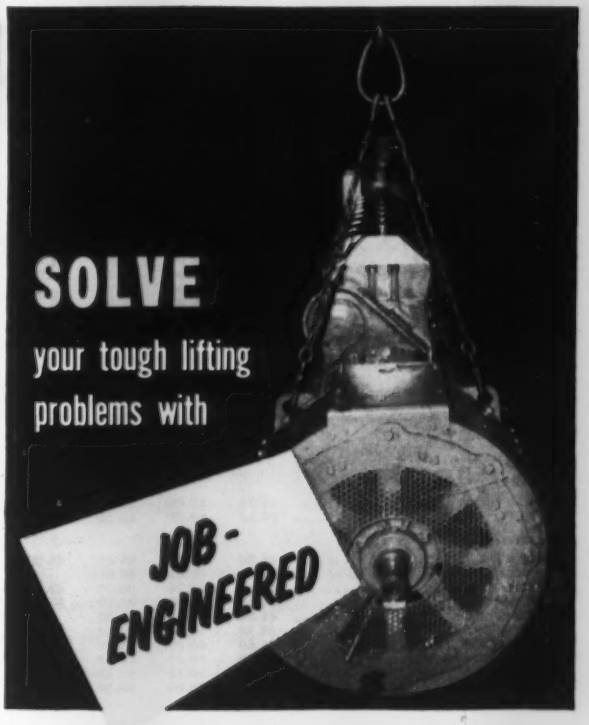

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Pig Iron

F.o.b. furnace prices in dollars per gross tons, as reported to STEEL. *Minimum delivered prices are approximate and do not include 3% federal tax.*

Birmingham District	Basic	No. 2 Foundry	Malleable	Bessemer
AlabamaCity,Ala. R2	58.50	59.00	....	....
Birmingham R2	58.50	59.00‡	....	....
Birmingham U6	....	59.00‡	63.00	....
Woodward,Ala. W15	58.50	59.00‡	63.00	....
Cincinnati, deld.	....	66.70	....	....
Buffalo District				
Buffalo H1, R2	62.50	63.00	63.50	64.00
Tonawanda,N.Y. W12	62.50	63.00	63.50	64.00
N.Tonawanda,N.Y. T9	....	63.00	63.50	64.00
Boston, deld.	73.79	74.29	74.79	....
Rochester,N.Y., deld.	65.52	66.02	66.52	....
Syracuse,N.Y., deld.	66.62	67.12	67.62	....
Chicago District				
Chicago I-3	62.50	63.00	63.00	63.50
Gary,Ind. U5	62.50	....	63.00	....
S.Chicago,Ill. R2	62.50	....	63.00	....
S.Chicago,Ill. Y1	62.50	63.00	63.00	....
S.Chicago U5	62.50	....	63.00	63.50
S.Chicago,Ill. W14	62.50	....	63.00	63.50
Milwaukee deld.	64.80	65.30	65.30	65.80
Muskegon,Mich. deld.	....	69.68	69.68	....
Cleveland District				
Cleveland R2, A7	62.50	63.00	63.00	63.50
Akron,O., deld.	65.25	65.75	65.75	66.25
Mid-Atlantic District				
Bethlehem,Pa. B2	64.50	65.00	65.50	66.00
New York, deld.	....	69.01	69.51	....
Newark, deld.	67.70	68.20	68.70	69.20
Birdsboro,Pa. B10	64.50	65.00	65.50	66.00
Chester,Pa. P4	64.50	65.00	65.50	....
Philadelphia, deld.	66.26	66.76	67.26	....
Steelton,Pa. B2	64.50	65.00	65.50	66.00
Swedeland,Pa. A3	64.50	65.00	65.50	66.00
Philadelphia, deld.	66.26	66.76	67.26	67.76
Troy,N.Y. R2	64.50	65.00	65.50	66.00
Pittsburgh District				
NevilleIsland,Pa. P6	62.50	63.00	63.00	63.50
Pittsburgh (N&S sides), Aliquippa, deld.	....	64.45	64.45	64.95
McKeesRocks, deld.	....	64.10	64.10	64.63
Lawrenceville, Homestead, Wilmerding,Monaca, deld.	....	64.76	64.76	65.29
Verona,Trafford, deld.	64.79	65.32	65.32	65.85
Brackenridge, deld.	65.10	65.60	65.60	66.13
Bessemer,Pa. U5	62.50	....	63.00	63.50
Clairton,Rankin,S.Duquesne,Pa. U5	62.50	....	....	....
Midland,Pa. C18	62.50	....	....	....

Youngstown District	Basic	No. 2 Foundry	Malleable	Bessemer
Hubbard,O. Y1	....	....	63.00	....
Sharpeville,Pa. S6	62.50	....	63.00	63.50
Youngstown Y1	....	....	63.00	63.50
Mansfield,O. deld.	67.40	....	67.90	68.40
Duluth I-3	62.50	63.00	63.00	63.50
Erie,Pa. I-3	62.50	63.00	63.00	63.50
Everett,Mass. E1	63.25	63.75	64.25	....
Fontana,Calif. K1	70.00	70.50	....	....
Geneva,Utah C11	62.50	63.00	....	....
GraniteCity,Ill. G4	64.40	64.90	65.40	....
Ironton,Utah C11	62.50	63.00	....	....
LoneStar,Texas L6	58.50*	59.00†	....	....
Minnequa,Colo. C10	64.50	65.00	65.50	....
Rockwood,Tenn. T3	....	59.00‡	63.00	....
Toledo,O. I-3	62.50	63.00	63.00	63.50
Cincinnati, deld.	68.26	68.76	....	....

*Phos. 0.51-0.75%; Phos. 0.31-0.50%, $59.50.
†Phos. 0.51-0.75%; Phos. 0.31-0.50%, $60.
‡Phos. 0.70-0.90%; intermediate (Phos. 0.31-0.69%), $60.

PIG IRON DIFFERENTIALS

Silicon: Add 50 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.50% manganese over 1% or portion thereof.

Nickel: Under 0.05% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1.25 for each 0.5% Si; 75 cents for each 0.50% Mn over 1%)

Jackson,O. I-3, J1	71.50
Buffalo H1	72.75

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon: add $1 for each 0.5% Si to 18%; $1 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

Niagara Falls,N.Y. P15	$92.50
Keokuk,Iowa, Open-hearth & Fdry, freight allowed K2	102.00
Keokuk, O.H. & Fdry, 12½ lb pigiets, 16% Si, frgt allowed K2	105.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$76.50
Rockwood,Tenn. T3 (Phos. 0.035% max)	76.50
Steelton,Pa. B2 (Phos. 0.035% max)	70.50
Philadelphia, deld.	74.05
Troy,N.Y. R2 (Phos. 0.035% max)	70.50
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	67.50
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	67.50
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	67.50
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	67.50

Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: St. Paul, 25 cents; Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, San Francisco, Spokane, 10 cents; Atlanta, Houston, Seattle, no charge.

	SHEETS				STRIP	BARS				Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Merchant Qual.	H.R. Spec. Qual.	C.F. Rds.§	H.R. Alloy 4140††		Carbon	Floor
Atlanta	8.07‖	9.27‖	9.83‖	....	8.16	8.30	...	10.14	....	8.44	8.40	10.22
Baltimore	7.79	8.99	9.12	....	8.27	8.34	8.87	9.09¹⁰	15.69	8.57	8.12	9.56
Birmingham	7.68‖	8.88‖	8.85‖	....	7.78	7.91	8.44	10.04	....	8.05	8.01	10.04
Boston	8.70	9.73	10.92	....	8.79	8.88	9.43	10.71	14.46	8.90	8.98	10.39
Buffalo	7.75	8.90	10.72	....	8.00	8.00	8.70	8.70	14.30	8.25	8.25	9.80
Chattanooga	7.90‖	9.10‖	9.10‖	....	8.00	8.13	8.66	9.96	....	8.27	8.23	9.98
Chicago	7.70	8.90	9.70	....	7.78	7.91	8.44	8.35	13.95	8.05	8.01	9.28
Cincinnati	7.82	8.89	9.70	....	8.06	8.19	8.72	8.82	14.23	8.55	8.34	9.53
Cleveland	7.68	8.88	9.60	....	7.88	7.99	8.52	8.60	14.03	8.38	8.21	9.46
Denver	9.55	11.09	12.41	....	9.70	9.75	...	10.54	15.89	9.60	9.50	11.15
Detroit	7.91	9.13	10.02	....	8.10	8.18	8.71	8.68	14.19	8.55	8.33	9.49
Erie, Pa.	7.75	8.88	9.60¹⁰	....	7.90	8.00	8.65	8.70¹⁰	....	8.35	8.20	9.50
Houston	8.70	9.65	10.99	....	8.80	8.95	9.50	10.70	15.00	9.40	9.10	10.60
Jackson, Miss.	8.00‖	9.20‖	9.22‖	....	8.10	8.23	8.76	10.14	....	8.37	8.33	10.08
Los Angeles	8.90	10.65	11.65	....	9.10	8.80	9.50	11.70	15.25	8.95	9.35	11.50
Milwaukee	7.82	9.02	9.82	....	7.90	8.03	8.56	8.57	14.07	8.24	8.13	9.37
Moline, Ill.	7.48	8.59	9.45	....	7.56	7.62	...	8.10	....	7.78	7.80	...
New York	8.35	9.53	10.23	67.73	8.81	8.53	9.38	10.61	14.37	8.74	8.78	10.05
Norfolk, Va.	7.85	...	...	....	8.30	8.35	..	10.80	....	8.60	8.10	9.60
Philadelphia	7.89	9.08	10.12	....	8.58	8.37	8.90	9.12	14.15	8.38	8.28	9.37
Pittsburgh	7.68	8.88	10.05	50.00	7.88	7.91	8.44	8.60	13.95	8.05	8.01	9.28
Portland, Oreg.	8.95	9.65	11.40	....	9.05	8.95	...	13.55	14.80	8.90	8.70	11.60
Richmond, Va.	8.05	...	10.09	....	8.45	8.70	9.20	10.00	....	8.80	8.35	9.70
St. Louis	8.02	9.21	10.03	....	8.11	8.25	8.78	8.93	14.28	8.48	8.34	9.59
St. Paul	7.83	8.78	9.80	....	7.91	7.97	...	8.70	....	8.13	8.15	9.42
San Francisco	8.75	10.30	10.80	....	8.95	8.80	9.35	12.30	15.25	8.85	8.85	11.15
Seattle	9.35	11.20	11.55	....	9.50	9.30	9.85	13.15	15.55	9.15	9.05	11.25
Spokane, Wash.	9.35	11.35	11.55	....	9.50	9.30	9.85	13.15	16.30	9.15	9.05	11.25
Washington	8.31	10.43	...	....	8.99	8.74	...	9.90	....	9.02	8.64	11.10

*Prices do not include gage extras; †prices include gage and coating extras (based on 12.50c zinc at Los Angeles and 13.50c at other points), except in Birmingham (coating extra excluded); ‡includes 35-cent bar quality extras; **¼-in. and heavier; ††as annealed; §42 in. and under.

Base quantities, 2000 to 4999 lb except as noted; Cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb; ⁸—400 to 999 lb; ⁹—1000 to 1999 lb; ¹⁰—2000 to 3999 lb; ¹⁵—2000 lb and over.

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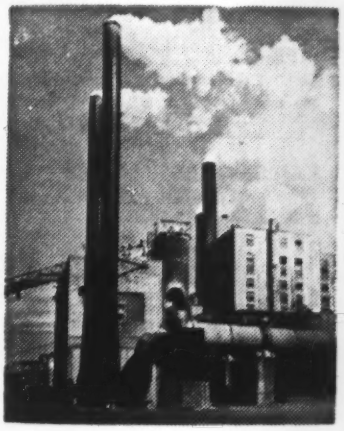

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(*Concluded from page 284*)

Cement Co. plant, Metaline Falls, Wash., to Bethlehem Pacific Coast Steel Corp., Seattle; Henry George & Son, Spokane, Wash., general contractor.

800 tons, Aurora avenue undercrossing, Seattle, to Bethlehem Pacific Coast Steel Corp., Seattle; Butler Construction & Engineering Co., Seattle, general contractor.

305 tons, ammunition storage igloos, Paine Air Field, Everett, Wash., to Joseph T. Ryerson & Son Inc., Seattle; Roy T. Earley Co., Tacoma, Wash., general contractor, low at $902,916.

250 tons, also piling, Green river bridge, Eagle Gorge dam flood project, Washington state, to unstated interest; general award to U.S. Engineer, Seattle.

100 tons, also 70 tons of shapes, Benton county, Wash., Yakima river bridge, to unstated interest; Everett McKellar, Chelan, Wash., general contractor at $185,159.

300 tons, hospital building, Rutland, Vt., to Bethlehem Steel Co., Bethlehem, Pa.; B. Perini & Sons Inc., Framingham, Mass., general contractor.

330 tons, junior high school, Rockville, Md., to Ceco Steel Products Corp., Philadelphia; J. D. Hedin Construction Co., Washington, general contractor.

230 tons, women's educational building, University of Massachusetts, Amherst, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; M. J. Walsh & Sons Inc., Holyoke, Mass., general contractor.

100 tons, addition, Thayer Hospital, Waterville, Me., to Bancroft & Martin Rolling Mills Co., South Portland, Me.; Consolidated Constructors Inc., Portland, Me., general contractor.

325 tons, maintenance hangar, naval air station, Chincoteague, Va., to Hall-Hodges Co. Inc., Norfolk, Va.; Irons & Reynolds Inc., Washington, general contractor.

500 tons, including structurals, dormitory, Johns Hopkins University, Baltimore, to Bethlehem Steel Co., Bethlehem, Pa. (bars) and John McKenzie & Co. Inc., Baltimore (structurals); Consolidated Engineering Co., Baltimore, general contractor.

140 tons, manufacturing plant, S. O. & C Division, United Shoe Machinery Corp., Shelton, Conn., to U.S. Steel Supply Division, U.S. Steel Corp., Boston; Edwin Moss & Son Inc., Bridgeport, Conn., general contractor.

500 tons, administration treatment building, veterans' hospital, Bedford, Mass., to Truscon Steel Division, Republic Steel Corp., Boston; John A. Volpe Construction Co., Malden, Mass., general contractor.

600 tons, barracks and miscellaneous facilities, naval air station, Oceana, Va., to Hall-Dodges Co. Inc., Norfolk, Va.; Virginia Engineering Co. Inc., Newport News, Va., general contractor.

550 tons, Einstein Medical Hospital, Philadelphia, to American Steel Engineering Co., Philadelphia.

900 tons, state office building, Philadelphia, to Sweets Steel Co., Williamsport, Pa., through John McShain Inc., Philadelphia.

REINFORCING BARS PENDING

5800 tons, also 1400 tons of plates, Wahluke siphon project, Columbia Basin, Washington state; general contract to E. W. Construction Co., Eugene, Oreg.; bids opened by Bureau of Reclamation Aug. 22.

800 tons, second powerhouse, Ft. Peck dam, Montana; bids to U.S. Engineer, Garrison, Mont., Oct. 9.

75 tons, also miscellaneous steel, 360-ft bridge, Douglas county, Oreg.; bids to Bureau of Public Roads, Portland, Oreg., Oct. 4.

55 tons, also unstated tonnage of shapes, Bureau of Reclamation project, Othello, Wash.; Cherf Bros. & Sandkay Inc., Ephrata, Wash., low at $108,580.

PLATES . . .

PLATES PLACED

100 tons, water tank, Veterans' hospital, Togus, Me., to Chicago Bridge & Iron Co., Chicago.

300 tons, H-piling, Aurora avenue undercrossing, Seattle, to Bethlehem Pacific Coast Steel Corp., Seattle; Butler Construction & Engineering Co., Seattle, general contractor.

PLATES PENDING

200 tons, sheet piling, Aurora avenue undercrossing, Seattle; may be placed with foreign producer.

PIPE . . .

CAST IRON PIPE PLACED

350 tons, 12 and 8 in., system improvement, Everett, Wash., to U.S. Pipe & Foundry Co., Seattle.

RAILS, CARS . . .

RAILROAD CARS PLACED

Gulf, Mobile & Ohio, 250 fifty-ton boxcars to the Bessemer, Ala., plant of the Pullman-Standard Car Mfg. Co.; 100 seventy-ton covered hopper cars to the Greenville Steel Car Co., Greenville, Pa.

RAILROAD CARS PENDING

Bureau of Mines, Interior Department, 15 tanks for shipment of helium under pressure; bids Oct. 22, Amarillo, Tex.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE			CARBON		
——Inches——		Per	——Inches——		Per
Diam	Length	100 lb	Diam	Length	100 lb
2	24	$57.75	8	60	13.30
2½	30	37.25	10	60	13.00
3	40	35.25	12	60	14.05
4	40	33.25	14	60	12.85
5¼	40	33.00	14	72	11.95
6	60	30.00	17	60	11.85
7	60	26.75	17	72	11.40
8, 9, 10	60	26.50	20	84	11.40
12	72	25.00	20	90	11.00
14	60	25.00	24	72, 84	11.25
16	72	24.50	24	96	10.95
17	60	24.50	30	84	11.05
18	72	24.50	40, 35	110	10.70
20	72	24.00	40	100	10.70

Scrap Price Composite Eases

STEEL's index on steelmaking grades drops $1.50 to $58.17, reversing the trend in effect for many weeks. Market continues strong though demand pressure is off somewhat

Scrap Prices, Page 298

Pittsburgh—With market pressure off, prices on the chief steelmaking grades slipped last week on a purchase by U.S. Steel Corp. No. 1 heavy melting went at $57 a ton, off $2 from the previous representative purchase, while No. 2 heavy melting went at $51, off $1 from the previous buy. Surprisingly, No. 2 bundles moved at $48, unchanged. Jones & Laughlin later in the week bought No. 1 steel at $56.

Generally, the lower price on No. 1 steel here is not considered a realistic reflection of the market situation because No. 1 scrap is flowing into Youngstown on old contracts at $65 and $66 a ton.

New York—Heavy melting steel scrap prices are down $1 a ton, except No. 2 bundles for which grade brokers are paying $2 a ton less.

Philadelphia—No. 1 heavy melting steel, busheling and bundles, including No. 2 bundles, are off $2 a ton on new buying by the leading eastern consumer. Against old orders $59, delivered, is paid.

Boston—While exports and district domestic shipments tend to support the market, brokers are paying $1 to $1.50 a ton less for domestic shipment material, following new buying at lower levels for eastern Pennsylvania shipment.

Chicago — Purchases of some steel grades at $1 to $2 below the last acquisitions suggest that the market is about to level off following a steady rise since the start of the steel strike on July 1. Grades affected are No. 1 dealer heavy melting, No. 2 heavy melting, No. 1 dealer bundles, No. 2 bundles and No. 1 railroad heavy melting.

Buffalo—No. 1 heavy melting steel has moved up $1 a ton to $57-$58 on the basis of new sales. Cast scrap also is higher, cupola cast now selling at $50, up $2. No. 1 machinery cast is up $1 to $55.

Cincinnati—Prices are holding in the absence of new buying. No. 1 heavy melting is quoted $57-$58.

St. Louis—The scrap market has leveled off pricewise. Considerable material is moving, except rails, and consumers are not pushing the market like they were recently.

Birmingham—Except for open-hearth material, prices are strong on all grades of scrap. Many specialty items were quoted higher last week. So were the cast iron grades.

Los Angeles — Prices have jumped sharply. No. 1 heavy melting advanced $6 to $50, and No. 2 $7 to $47 a ton. No. 1 bundles moved up $5 to $48, No. 2 bundles $7 to $40, and machine shop turnings $4 to $29.

The report published in our Sept. 10 issue to the effect that scrap was flowing *from* the Orient through Los Angeles ports should have read: "Scrap *for* the Orient is flowing through Los Angeles ports."

Detroit—Prices are unchanged. A decline is anticipated in the market after bids on the automotive lists become known.

Cleveland—An easier tone prevails in scrap here, largely reflecting sales at Pittsburgh $1 to $2 under prices that recently prevailed. Still, the market here is unchanged. Bids on automotive lists will indicate the trend over coming weeks. Larger tonnage of production scrap is available, one local automotive plant offering 18,000 tons of bundles. A lower level of prices is expected.

San Francisco—The market is firm here. Recently established higher prices are holding, but they have not brought out much additional material.

Seattle—Prices are firm. Receipts are large, with consumption heavy. Exports are above normal. Last week, a cargo of 9000 tons left this port for Japan. So far this year, 50,000 tons have been exported from Puget Sound.

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Iron and Steel Scrap

Consumer prices, per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Sept. 26	$58.17
Sept. 19	59.67
Sept. Avg.	59.08
Oct. 1955	45.17
Oct. 1951	43.60

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	*56.00-57.00*
No. 2 heavy melting	*50.00-51.00*
No. 1 bundles	*56.00-57.00*
No. 2 bundles	47.00-48.00
No. 1 busheling	*56.00-57.00*
Machine shop turnings	39.00-40.00
Mixed borings, turnings	39.00-40.00
Short shovel turnings	43.00-44.00
Cast iron borings	43.00-44.00
Cut structurals, 3 ft lengths	67.00-68.00
Heavy turnings	53.00-54.00
Punchings & plate scrap	67.00-68.00
Electric furnace bundles	67.00-68.00

Cast Iron Grades

No. 1 cupola	54.00-55.00
Heavy breakable cast	49.00-50.00
Unstripped motor blocks	36.00-37.00
No. 1 machinery cast	58.00-59.00

Railroad Scrap

No. 1 R.R. heavy melt	68.00-69.00
Rails 2 ft and under	78.00-79.00
Rails 18 in. and under	79.00-80.00
Rails random lengths	75.00-76.00
Railroad specialties	74.00-75.00

Stainless Steel Scrap

18-8 bundles & solids	395.00-405.00
18-8 turnings	275.00-290.00
430 bundles & solids	110.00-120.00
430 turnings	60.00-65.00

CLEVELAND

No. 1 heavy melting	62.50-63.50
No. 2 heavy melting	44.00-45.00
No. 1 bundles	62.50-63.50
No. 2 bundles	40.00-41.00
No. 1 busheling	62.50-63.50
Machine shop turnings	32.50-33.50
Mixed borings, turnings	36.50-37.50
Short shovel turnings	36.50-37.50
Cast iron borings	36.50-37.50
Low phos.	62.50-63.50
Cut structural plates 2 ft and under	68.00-69.00
Alloy free, short shovel turnings	43.00-44.00
Electric furnace bundles	62.50-63.50

Cast Iron Grades

No. 1 cupola	57.00-58.00
Charging box cast	50.00-51.00
Heavy breakable cast	48.00-49.00
Stove plate	54.00-55.00
Unstripped motor blocks	36.00-37.00
Brake shoes	44.00-45.00
Clean auto cast	56.00-57.00
Burnt cast	43.00-44.00
Drop broken machinery	59.00-60.00

Railroad Scrap

No. 1 R.R. heavy melt.	65.00-66.00
R.R. malleable	70.00-71.00
Rails, 2 ft and under	83.00-84.00
Rails, 18 in. and under	84.00-85.00
Rails, random lengths	80.00-81.00
Cast steel	69.00-70.00
Railroad specialties	74.00-75.00
Uncut tires	73.00-74.00
Angles, splice bars	75.00-76.00
Rails, rerolling	82.00-83.00

Stainless Steel

(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	380.00-390.00
18-8 turnings	250.00-260.00
430 clips, bundles, solids	100.00-110.00
430 turnings	50.00-60.00

YOUNGSTOWN

No. 1 heavy melting	65.00-66.00
No. 2 heavy melting	47.00-48.00
No. 1 bundles	65.00-66.00
No. 2 bundles	43.00-44.00
No. 1 busheling	65.00-66.00
Machine shop turnings	34.00-35.00
Short shovel turnings	38.00-39.00
Cast iron borings	38.00-39.00
Low phos.	65.00-66.00
Electric furnace bundles	65.00-66.00

Railroad Scrap

No. 1 R.R. heavy melt.	66.00-67.00

CHICAGO

No. 1 heavy melting	*58.00-62.00*
No. 2 heavy melting	*48.00-49.00*
No. 1 factory bundles	64.00-65.00
No. 1 dealer bundles	*58.00-59.00*
No. 2 bundles	43.00-44.00
No. 1 busheling	*58.00-62.00*
Machine shop turnings	*36.00-37.00*
Mixed borings, turnings	38.00-39.00
Short shovel turnings	38.00-39.00
Cast iron borings	38.00-39.00
Cut structurals, 3 ft	*64.00-65.00*
Punchings & plate scrap	*65.00-66.00*

Cast Iron Grades

No. 1 cupola	53.00-54.00
Stove plate	47.00-48.00
Unstripped motor blocks	41.00-42.00
Clean auto cast	57.00-58.00
Drop broken machinery	57.00-58.00

Railroad Scrap

No. 1 R.R. heavy melt.	*63.00-64.00*
R.R. malleable	71.00-72.00
Rails, 2 ft and under	*81.00-82.00*
Rails, 18 in. and under	82.00-83.00
Angles, splice bars	73.00-74.00
Rails, rerolling	84.00-85.00

Stainless Steel Scrap

18-8 bundles & solids	450.00-470.00
18-8 turnings	350.00-379.00
430 bundles & solids	70.00-75.00
430 turnings	52.50-57.50

DETROIT

Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	55.00
No. 2 heavy melting	43.00
No. 1 bundles	56.00
No. 2 bundles	39.00
No. 1 busheling	55.00
Machine shop turnings	30.00
Mixed borings, turnings	33.00
Short shovel turnings	34.00
Punchings & plate scrap	60.00

Cast Iron Grades

No. 1 cupola	48.00
Charging box cast	41.00
Stove plate	42.00
Heavy breakable	41.00
Unstripped motor blocks	32.00
Clean auto cast	53.00
Malleable	52.00

BIRMINGHAM

No. 1 heavy melting	42.00-43.00
No. 2 heavy melting	40.00-41.00
No. 1 bundles	42.00-43.00
No. 2 bundles	34.00-35.00
No. 1 busheling	42.00-43.00
Cast iron borings	25.00-26.00
Short shovel turnings	*35.00-36.00*
Machine shop turnings	*33.00-34.00*
Bar crops and plate	*59.00-60.00*
Structural & plate, 2 ft	57.00-58.00
Electric furnace bundles	53.00-54.00

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	*53.00-54.00*
Stove plate	*51.00-52.00*
Unstripped motor blocks	*45.00-46.00*
Charging box cast	40.00-41.00
No. 1 wheels	*45.00-46.00*

Railroad Scrap

No. 1 R.R. heavy melt.	50.00-51.00
Rails, 18-in. and under	*74.00-75.00*
Rails, rerolling	*77.00-78.00*
Rails, random lengths	*69.00-70.00*
Angles, splice bars	*68.00-69.00*

PHILADELPHIA

No. 1 heavy melting	*57.00-59.00*
No. 2 heavy melting	50.00
No. 1 bundles	*57.00-59.00*
No. 2 bundles	*47.00-49.00*
No. 1 busheling	*57.00-59.00*
Electric furnace bundles	61.00
Mixed borings, turnings	41.00
Machine shop turnings	41.00
Short shovel turnings	45.00
Heavy turnings	54.00
Structurals & plates	62.00-63.00
Couplers, springs, wheels	70.00
Rail crops, 2 ft & under	76.00-77.00

Cast Iron Grades

No. 1 cupola	53.00-55.00
Malleable	68.00
Heavy breakable cast	56.00-57.00
Drop broken machinery	58.00-59.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	*52.00-53.00*
No. 2 heavy melting	*42.00-43.00*
No. 1 bundles	*52.00-53.00*
No. 2 bundles	*40.00-41.00*
Machine shop turnings	32.00-33.00
Mixed borings, turnings	31.00-32.00
Short shovel turnings	37.00-38.00
Low phos. (structural & plate)	54.00-55.00

Cast Iron Grades

No. 1 cupola	46.00-47.00
Unstripped motor blocks	36.00-37.00
Heavy breakable	48.00-48.50

Stainless Steel

18-8 sheets, clips, solids	350.00-360.00
18-8 borings, turnings	190.00-200.00
430 sheets, clips, solids	115.00-120.00
410 sheets, clips, solids	105.00-110.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*50.00-50.50*
No. 2 heavy melting	*38.00-39.00*
No. 1 bundles	*50.00-50.50*
No. 2 bundles	*36.50-37.00*
No. 1 busheling	*49.00-50.00*
Machine shop turnings	29.00-30.00
Mixed borings, turnings	31.00-32.00
Short shovel turnings	33.00-34.00
No. 1 cast	44.00-44.50
Mixed cupola cast	39.50-40.00
No. 1 machinery cast	45.50-46.00

BUFFALO

No. 1 heavy melting	*57.00-58.00*
No. 2 heavy melting	45.00-46.00
No. 1 bundles	*57.00-58.00*
No. 2 bundles	42.00-43.00
No. 1 busheling	*57.00-58.00*
Mixed borings, turnings	34.00-35.00
Machine shop turnings	31.00-32.00
Short shovel turnings	35.00-36.00
Cast iron borings	34.00-35.00
Low phos.	60.00-61.00

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	*49.00-50.00*
No. 1 machinery	*54.00-55.00*

Railroad Scrap

Rails, random lengths	71.00-72.00
Rails, 3 ft and under	77.00-78.00
Railroad specialties	68.00-69.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	57.00-58.00
No. 2 heavy melting	46.00-47.00
No. 1 bundles	57.00-58.00
No. 2 bundles	43.00-44.00
No. 1 busheling	57.00-58.00
Machine shop turnings	35.50-36.50
Mixed borings, turnings	37.00-38.00
Short shovel turnings	40.00-41.00
Cast iron borings	37.00-38.00
Low phos., 18 in.	62.00-63.00

Railroad Scrap

No. 1 cupola	48.00-49.00
Heavy breakable cast	47.00-48.00
Charging box cast	48.00-49.00
Drop broken machinery	58.00-59.00

Railroad Scrap

No. 1 R.R. heavy melt.	62.00-63.00
Rails 18 in. and under	77.00-78.00
Rails random lengths	68.00-69.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	53.00
No. 2 heavy melting	45.00
No. 1 bundles	53.00
No. 2 bundles	41.00
No. 1 busheling	53.00
Machine shop turnings	32.00
Short shovel turnings	36.00

Cast Iron Grades

No. 1 cupola	50.00
Charging box cast	44.00
Heavybreakable cast	44.00
Unstripped motor blocks	44.00
Brake shoes	51.00
Clean auto cast	54.00
Stove plate	45.50

Railroad Scrap

No. 1 R.R. heavy melt.	63.50
Rails, 18 in. and under	82.00
Rails, rerolling	88.00
Rails, random lengths	*79.00*
Angles, splice bars	*69.00*

SEATTLE

No. 1 heavy melting	50.00
No. 2 heavy melting	46.00
No. 1 bundles	42.00
No. 2 bundles	31.00
Machine shop turnings	25.00-27.00
Mixed borings, turnings	25.00-27.00
Electric furnace No. 1	58.00-60.00

Cast Iron Grades

No. 1 cupola	46.00-48.00
Heavy breakable cast	42.00-44.00
No. 1 wheels	37.00
Unstripped motor blocks	44.00
Stove plate (f.o.b. plant)	35.00-37.00

LOS ANGELES

No. 1 heavy melting	*50.00*
No. 2 heavy melting	*47.00*
No. 1 bundles	*48.00*
No. 2 bundles	*40.00*
Machine shop turnings	*29.00*

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	46.00

SAN FRANCISCO

No. 1 heavy melting	50.00
No. 2 heavy melting	47.00
No. 1 bundles	48.00
No. 2 bundles	42.00
Machine shop turnings	30.00
Mixed borings, turnings	30.00
Cast iron borings	30.00
Heavy turnings	30.00
Short shovel turnings	33.00
Cut structurals	58.00

Cast Iron Grades

No. 1 cupola	55.00
Charging box cast	45.00-47.00
Stove plate	48.00
Heavy breakable cast	42.00
Unstripped motor blocks	47.00
Clean auto cast	55.00
No. 1 wheels	45.00-47.00
Drop broken machinery	55.00

HAMILTON, ONT.

No. 1 heavy melting	52.00
No. 2 heavy melting	47.00
No. 1 bundles	52.00
No. 2 bundles	42.50
Mixed steel scrap	46.00
Buseling, new factory: Prepared	50.00
Unprepared	46.00
Short steel turnings	34.00

Cast Iron Grades†

No. 1 machinery cast	50.00

†F.o.b., Hamilton, Ont.

Leaders in Iron & Steel Scrap Since 1889

For over half a century our experience, personnel, equipment and key office locations have contributed to the steady growth of the iron and steel industry. Possibly our facilities may help you solve a problem in iron or steel scrap—no matter how big or small.

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EXPORTERS & CONTRACTORS FOR EXPORT

Demand Creeps Up

Sales of copper, lead, zinc and aluminum are improving gradually. Automotive production will be the catalyst to insure the best quarter of this year

Nonferrous Metal Prices, Pages 302 & 303

NONFERROUS people are quietly confident about the fourth quarter. Most are waiting for substantial orders before admitting that the quarter will be nearly as good as last year's.

Lead—Sales are showing gains, rising slightly above the relatively high plateau they have enjoyed for the last several weeks. Sellers point out that good across-the-board sales most of this year have brought few headaches to sellers. The U.S. barter program—trading perishable commodities for lead and zinc—and the purchase of these metals for the strategic stockpile have enabled the price of lead to stay firm at the 16 cent a pound level.

Zinc — Says one spokesman: "Zinc sales are picking up, but there is still no zip in the market." Most producers point out that few customers are pushing for release of October metal. It may mean that automotive contracts, which will act as a catalyst for a peak showing by all nonferrous metals during the fourth quarter, will not be let for another two or three weeks. A producer reports: "The contracts we have seen so far are for shipments of diecastings through November."

Motordom appears to be playing it close to the vest, waiting for the initial sales reaction on its new models before issuing volume orders.

Copper—Some large metalworking fabricators are not ordering this metal because it is impossible for them to get needed steel to produce finished products. "Until they can get steel," reports a producer, "they are not going to inventory copper."

Copper sales are showing slight gains. Over-all, the market is steady and a bit quiet. The London Metal Exchange asking price nuzzled around the 37 cent a pound mark last week. Custom smelters continue to quote 39 cents a pound, but there are indications that the price could drop if demand does not pick up in the next week or two. Problem: Brass mills are still waiting to hear from Detroit.

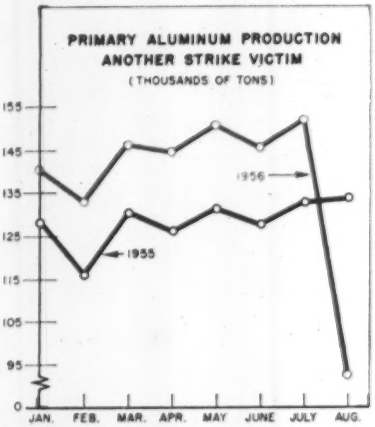
Copper wire and cable sales continue at high levels. Producers report that sales to the construction industry are getting so competitive that most of the profit is being taken out of many jobs. Sales to the utility industry are holding at high levels, with normal competitive pressures. Copper tubing sales to the plumbing industry are picking up, but users are buying for each job instead of carrying any inventory.

Copper note: Bache & Co. says: "Reports received from Chile show that its copper production has been sold abroad for delivery through the greater part of 1957, with the exception of that portion being sold for U.S. consumption."

Outlook: Primary producers are in comfortable positions, having little difficulty selling quotas. Secondary producers may be scrambling for another week or two but are assured of peak fourth quarter sales.

Tin Plant for Sale

The Federal Facilities Corp. hopes to find a buyer for the government's Texas City tin smelter by Nov. 1. Current value: About $6 million. Facilities include a smelter plant and waste acid plant. While the government hopes someone will buy it to produce tin, industry observers are guesstimating that it will be sold for other purposes at a greatly reduced price.



Source: Aluminum Association.

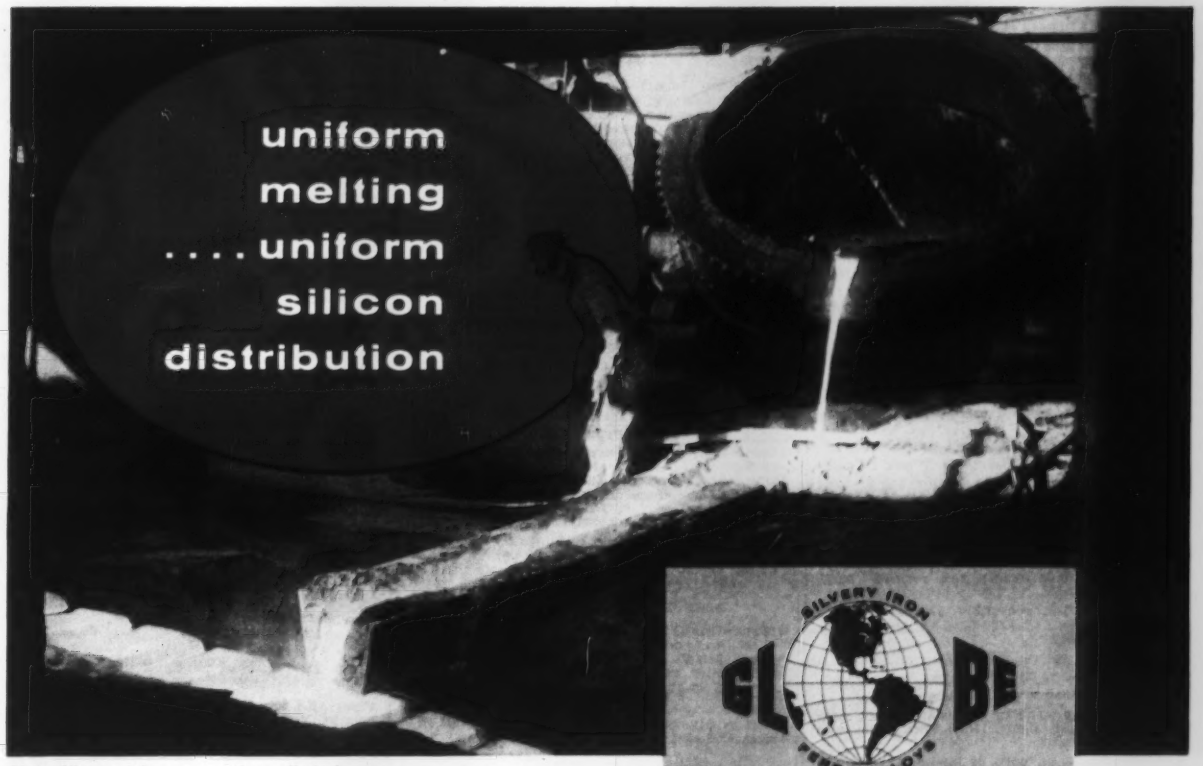
Aluminum Demand Grows

It will take 2.3 million to 2.4 million tons of primary aluminum to satisfy domestic demand during 1957, predict members of the Business & Defense Services Administration's Aluminum Producers Advisory Committee. Recommends the committee: There should be no stockpile during the first six months of 1957.

NONFERROUS PRICE RECORD

	Price Sept. 26	Last Change	Previous Price	Aug. Avg.	July Avg.	Sept., 1955 Avg.
Copper	39.00-40.00	Aug. 22, 1956	39.50-40.00	39.750	40.030	45.380
Lead	15.80	Jan. 13, 1956	16.30	15.800	15.800	14.920
Zinc	13.50	Jan. 6, 1956	13.00	13.500	13.500	12.940
Tin	104.00	Sept. 25, 1956	104.50	99.043	96.435	96.565
Nickel	64.50	Nov. 24, 1954	60.00	64.500	64.500	64.500
Aluminum	27.10	Aug. 10, 1956	25.90	26.700	25.900	24.400
Magnesium	35.25	Aug. 13, 1956	33.75	34.694	33.750	32.500

Quotations in cents per pound based on: COPPER, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingots, 99 + %, deld.; MAGNESIUM, pig, 99.8%, Velasco, Tex.

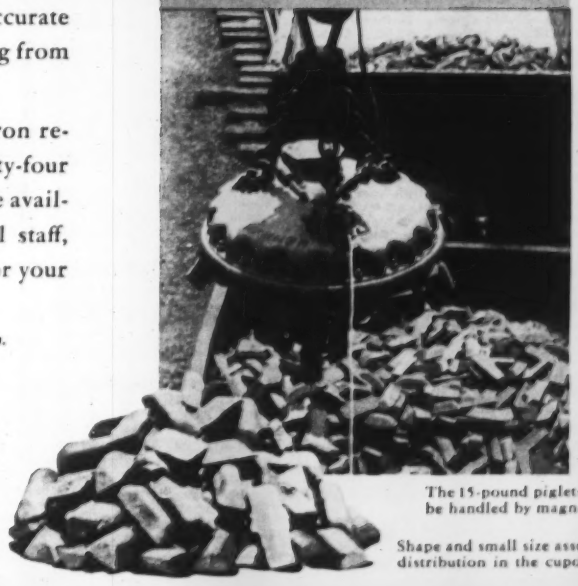


Globe Silvery piglets are cast from all-virgin ore.

Globe Silvery Pig Iron provides accurate silicon control with all grades ranging from 6% to 16% silicon.

Originated in 1872, Globe Silvery Iron remains, today, in a class by itself. Eighty-four years of research and development are available, through a skilled metallurgical staff, to help you select the correct grade for your requirements.

Service Department available without obligation.



The 15-pound piglets can easily be handled by magnet or hand.

Shape and small size assure even distribution in the cupola.

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CHICAGO • CINCINNATI • DETROIT • DULUTH
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Serving Industry Since 1883

IRON ORE • PIG IRON • COAL • COKE • FERROALLOYS

Nonferrous Metals

Cents per pound, carlots, except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99 + %, ingots, 27.10; pigs, 25.00, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 28.90; No. 43, 28.70; No. 195, 30.30; No. 214, 30.50; No. 356, 28.90. 30-lb ingots.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 97-99%, $2.60 per lb for 550-lb keg; $2.62 per lb for 100-lb case; $2.67 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 40.00 deld. Conn. valley; 40.00 deld. Midwest; custom smelters, 39.00 deld.; lake, 40.00 deld.; fire refined, 39.75 deld.

Germanium: First reduction, $201.85-$220 per lb; intrinsic grade, $220-$242.67 per lb, depending on quantity.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $90-$110 nom. per troy oz.

Lead: Common, 15.80; chemical, 15.90; corroding, 15.90, St. Louis. New York basis, add 0.20.

Lithium: 98 + %, cups or ingots, $11.50; rod $13.50; shot or wire, $14.50, f.o.b. Minneapolis, 100 lb lots.

Magnesium: Pig, 35.25; ingot, 36.00, f.o.b. Velasco, Tex. 13 in. sticks, 59.00, f.o.b. Madison, Ill.

Magnesium Alloys: AZ91B (diecasting), 37.25 deld.; AZ63A, AZ92A, AZ91C (sand castings), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $255-$257 per 76-lb flask.

Molybdenum: Extruded ingot, $9.60 per pound, f.o.b. Detroit.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 64.50; 10-lb pigs, unpacked, 67.65; "XX" nickel shot, 69.00; "F" nickel shot or ingots for addition to cast iron, 64.50; prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 0.92.

Osmium: $80-$100 per troy oz, nom.

Palladium: $23-$24 per troy oz.

Platinum: $103-$108 per troy oz from refineries.

Radium: $16-$21.50 per mg radium content, depending on quantity.

Rhodium: $118-$125 per troy oz.

Ruthenium: $45-$55 per troy oz.

Selenium: 99.5%, $13.50-$15.00 per lb.

Silver: Open market, 90.75 per troy oz.

Sodium: 16.50, c.l.; 17.00, l.c.l.

Tantalum: Sheet, rod, $68.70 per lb; powder, $56.63 per lb.

Tellurium: $1.50-$1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot, 104.00; prompt, 103.50.

Titanium: Sponge, 99.3 + %, grade A-1 ductile (0.3% Fe max), $3.00; grade A-2 (0.5% Fe max), $2.70 per pound.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $4.50 per lb, nom, f.o.b. shipping point; less than 1000 lb, add 15.00; 99 + % hydrogen reduced, $5.00. Treated ingot, $6.70.

Zinc: Prime Western, 14.00; brass special, 14.25; intermediate, 14.00, East St. Louis, freight allowed over 0.50 per pound. High grade, 14.85; special high grade, 15.25 deld. Diecasting alloy ingot No. 3, 18.00; No. 2, 19.00; No. 5, 18.50, deld.

Zirconium: Ingots, commercial grade, $14.40 per lb; low-hafnium reactor grade, $23.07. Sponge, commercial grade, $10.00 per lb; reactor grade, $14.00-$22.00 per lb, depending on quantity. Powder, electronics grade, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 27.00-27.75; No. 12 foundry alloy (No. 2 grade), 26.50; 5% silicon alloy, 0.60 Cu max, 28.00-28.25; 13 alloy, 0.60 cu max, 28.00-28.25; 195 alloy, 28.00-28.75; 108 alloy, 26.50-27.00. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 26.25; grade 2, 25.50; grade 3, 24.75; grade 4, 24.25.

Brass Ingot: Red brass, No. 115, 37.55; tin bronze, No. 225, 48.00; No. 245, 43.50; high-leaded tin bronze, No. 305, 41.00; No. 1 yellow, No. 405, 29.75; manganese bronze, No. 421, 33.00.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.50; AZ91C, 37.50; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nominal 1.9% Be alloy) Strip, $1.86-$1.91, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.88, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 45.355; l.c.l., 45.98. Weatherproof, 30,000-lb lots, 43.78; l.c.l., 44.53. Magnet wire deld., 15,000 lb or more, 52.68; l.c.l., 53.43.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh) Sheets, full rolls, 140 sq ft or more, $21.50 per cwt; pipe, full coils, $21.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill) Sheet and strip, $12.10-$13.00; sheared mill plate, $10.50-$12.00; wire, $9.50-$11.50; forging billets, $7.25-$7.50; hot-rolled and forged bars, $7.55-$7.80.

ZINC

(Prices per lb, c.l., f.o.b. mill) Sheets, 24.00; ribbon zinc in coils, 21.50; plates, 20.00.

ZIRCONIUM

Plate, $20.35; H.R. strip, $23.95; C.R. strip, $32.00; forged or H.R. bars, $18.40; wire, 0.015 in., 8.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets C.R.	113	97	118
Strip, C.R.	111	99	128
Plate, H.R.	107	96	111
Rod, Shapes, H.R.	94	80	99
Seamless Tubes	144	120	190

ALUMINUM

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
Drawn				
0.125	74.30	71.50	....	....
0.156-0.172	63.00	60.40	....	....
0.188	63.00	60.40	....	76.40
0.219-0.234	59.70	57.20	....	....
0.250-0.281	59.70	57.20	....	73.00
0.313	59.70	57.20	....	69.60
0.344	58.50	....	....	....
Cold-finished				
0.375-0.547	58.80	57.50	70.10	65.50
0.563-0.688	58.80	57.50	66.70	61.60
0.750-1.000	57.40	56.00	61.00	58.10
1.063	57.40	56.00	....	56.10
1.125-1.500	55.20	53.90	59.00	56.10
Rolled				
1.563	53.70	52.40	....	....
1.625-2.000	53.10	51.60	....	....
2.125-2.500	51.70	50.30	....	....
2.563-3.375	50.20	48.70	....	....

ALUMINUM (continued)

Sheets and Circles: 1100 and 3003 mill finish (30,000 lb base; freight allowed)

Thickness Range, Inches	Flat Sheet	Coiled Sheet
0.249-0.136	40.90-45.40	....
0.135-0.096	41.40-46.50	37.70-39.80
0.095-0.077	42.10-48.30	37.80-39.80
0.076-0.061	42.70-50.60	38.20-40.50
0.060-0.048	43.40-52.90	38.80-41.50
0.047-0.038	43.90-55.60	39.60-42.90
0.037-0.030	44.30-50.00	40.40-44.70
0.029-0.024	44.90-52.40	41.00
0.023-0.019	45.80-52.20	42.00
0.018-0.017	46.60-53.30	42.60
0.016-0.015	47.50-53.90	43.40
0.014	48.50-50.90	44.40
0.013-0.012	49.70-52.10	45.10
0.011	50.70-53.70	46.30
0.010-0.0095	52.10-54.40	47.60
0.009-0.0085	53.40	49.10
0.008-0.0075	55.00	50.03
0.007	56.50	51.80
0.006	58.10	53.20

Plates and Circles: Thickness 0.250-3 in. 24-60 in. width or diam, 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	40.2	44.5
5050-F	41.3	45.6
3004-F	42.3	47.5
5052-F	42.9	48.2
6061-T6	44.4	50.0
2024-T4*	48.1	54.4
7075-T6*	55.4	62.5

*24-48 in. widths or diam, 72-180 lengths.

Forging Stock: Round, Class 1, 43.30-55.90 in specific lengths 36-144 in., diameters 0.375-8 in. Rectangles and squares, Class 1, 48.10-63.20 in random lengths, 0.375-4 in. thick width 0.750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, standard lengths, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
⅛	$18.45	2	$ 57.00
1	29.00	4	157.20
1¼	39.25	6	281.65
1½	46.95	8	423.80

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	45.90-47.50	61.50-65.80
12-14	46.20-47.70	62.20-66.80
15-17	46.40-48.30	63.50-68.50
18-20	47.00-48.80	65.50-71.10

MAGNESIUM

Sheet and Plate: AZ31B standard grade, 0.32 in., 103.10; 0.81 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.0 in., 67.90. AZ31B spec. grade, .032 in., 171.30; .081 in., 108.70; .125 in., 98.10; .188 in., 95.70; .250-2.0, 93.30. Tread plate, .188 in., 71.70; .250-2.0 in., 70.60 Tooling plate, .250-3.0 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	69.60-72.40	84.60-87.40
12-14	70.70-73.00	85.70-88.00
24-26	75.60-76.30	90.60-91.30
36-38	89.20-90.30	104.20-105.30

NONFERROUS SCRAP

DEALERS' BUYING PRICES

(Cents per pound, New York, in ton lots; **Aluminum:** 1100 clippings 16.50-17.00; old sheets, 13.00-13.50; borings and turnings, 7.50-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnings
Copper	61.63b	58.86c	....	61.82	36.000	36.000	35.250
Yellow Brass	52.10	42.65d	52.64	55.01	27.250	27.000	25.125
Low Brass, 80%	55.55	55.79	54.39	58.66	30.625	30.375	29.875
Red Brass, 85%	57.19	57.13	57.73	60.00	31.875	31.625	31.125
Com. Bronze, 90%	59.08	59.02	59.62	61.64	33.125	32.875	32.375
Manganese Bronze	59.46	53.56	63.80	....	25.250	25.000	24.500
Muntz Bronze	53.84	49.65	....	....	25.625	25.375	24.875
Naval Brass	55.72	50.03	62.78	58.88	25.250	25.000	24.500
Silicon Bronze	65.22	64.41	65.26	67.26e	35.000	34.750	34.000
Nickel Silver, 10%	67.76	70.09g	70.09	....	32.750	32.500	16.375
Phos. Bronze, A, 5%	79.58	80.08	80.08	81.26	36.250	36.000	35.000

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20 000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. g. Leaded

8.00; crankcases, 13.00-13.50; industrial castings, 13.00-13.50.

Copper and Brass: No. 1 heavy copper and wire, 29.50-30.00; No. 2 heavy copper and wire, 28.50-29.00; light copper, 25.50-26.00; No. 1 composition red brass, 25.00-26.00; No. 1 composition turnings, 24.00-25.00; yellow brass turnings, 15.00-15.50; new brass clippings, 23.00-23.50; light brass, 14.50-15.00; heavy yellow brass, 16.50-17.00; new brass rod ends, 21.00-21.50; auto radiators, unsweated, 18.50-19.50; cocks and faucets, 18.50-19.50; brass pipe, 20.50-21.00.

Lead: Heavy, 12.50-13.00; battery plates, 7.00-7.25; linotype and stereotype, 13.50-14.00; electrotype, 12.50-13.00; mixed babbitt, 13.50-14.00.

Monel: Clippings, 80.00-90.00; old sheets, 70.00-80.00; turnings, 70.00-80.00; rods, 80.00-90.00.

Nickel: Sheets and clips, 130.00-195.00; rolled anodes, 130.00-195.00; turnings, 110.00-165.00; rod ends, 130.00-195.00.

Zinc: Old zinc, 4.50-5.50; new die-cast scrap, 4.00-4.50; old die-cast scrap, 2.50-3.00.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 20.00-20.50; 3003 clippings, 20.00-20.25; 6151 clippings, 20.00-20.25; 5052 clippings, 20.-20.25; 2014 clippings, 19.00-20.00; 2017 clippings, 19.00-20.00; 2024 clippings, 19.00-20.00; mixed clippings, 19.00; old sheets, 17.50; old cast, 17.50; clean old cable (free of steel), 19.25-20.00; borings and turnings, 17.00-18.50.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 62.00; light scrap, 57.00; turnings and borings, 42.00.

Copper and Brass: No. 1 heavy copper and wire, 33.00; No. 2 heavy copper and wire, 31.50; light copper, 29.25; refinery brass (60% copper) per dry copper content, 30.75.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 33.00; No. 2 heavy copper and wire, 31.50; light copper, 29.25; No. 1 composition borings, 29.00; No. 1 composition solids, 29.50; heavy yellow brass solids, 20.50; yellow brass turnings, 19.50; radiators, 22.50.

PLATING MATERIAL

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 58.29; oval, 57.54, 5000-10,000 lb; electrodeposited, 50.28; 2000-5000 lb lots; cast, 52.54, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, $1.015; 10-499 lb, 99.50; 500-4999 lb, 95.50; 5000-29,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, deduct 3 cents a lb. Prices eastern delivery.

Tin: Bar or slab: less than 200 lb, 123.50; 200-499 lb, 122.00; 500-999 lb, 121.50; 1000 lb or more, 121.00.

Zinc: Balls, 21.00; flat tops, 21.00; flats, 22.75; ovals, 22.00, ton lots.

CHEMICALS

Cadmium Oxide: $1.70 per lb, in 100-lb drums.

Chromic Acid: Less than 10,000 lb, 30.25, over 10,000 lb, 29.50.

Copper Cyanide: 100-1000 lb, 80.50.

Copper Sulphate: 500-1900 lb, 21.15; 2000 lb and over, 18.65.

Nickel Chloride: 100 lb, 46.50; 200 lb, 44.50; 300 lb, 43.50; 400-4900 lb, 41.50; 5000-9900 lb, 39.50; 10,000 lb and over, 38.50. Prices eastern delivery.

Nickel Sulphate: 100 lb, 38.25; 200 lb, 36.25; 300 lb, 35.25; 400-4900 lb, 33.25; 5000-35,900 lb, 31.25; 36,000 lb, 30.35. Prices eastern delivery.

Sodium Cyanide: Egg, under 1000 lb, 19.80; 1000-19,900 lb, 18.80; 20,000 lb and over, 17.80; granular, add 1-cent premium to above.

Sodium Stannate: Less than 100 lb, 73.80; 100-600 lb, 65.20; 700-1900 lb, 62.70; 2000-9900 lb, 61.00; 10,000 lb or more, 59.80.

Stannous Chloride (anhydrous): Less than 25 lb, 171.40; 25 lb, 136.40; 100 lb, 121.40; 400 lb, 119.00; 5200-19,600 lb, 106.80; 20,000 lb or more, 94.60.

Stannous Sulphate: Less than 50 lb, 133.90; 50 lb, 103.90; 100-1900 lb, 101.90; 2000 lb or more, 99.90.

Zinc Cyanide: Under 1000 lb, 55.55; 1000 lb and over, 53.55.

FERROALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton Pa. 21-23% Mn, $98.50; 19-21% Mn, 1-3% Si $96; 16-19% Mn, $94.00.

Standard Ferromanganese: (Mn 74-76%, C 7% approx.) Base price per net ton $215, Duquesne, Johnstown, Sheridan, Pa.; Philo, O.; Tacoma, Wash.; $235 Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74%, respectively.

Chromium Briquets: (Weighing approx. 3½ lb each and containing 2 lb of Cr). Contract, carload, bulk, 19c per lb of briquet, carload packed in box pallets 19.2c, in bags 20.1c; 3000 lb to c.l. in box pallets 20.4c; 2000 lb to c.l. in bags, 21.3c; less than 2000 lb in bags 22.2c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx 3 lb and containing 2 lb of Mn). Contract, carload, bulk 13.9c per lb of briquet, c.l. packed, pallets 14.1c bags 15.1c; 3000 lb to c.l., pallets 15.3c; 2000 lb to c.l. bags 16.3c, less ton 17.2c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx. 5 lb and containing 2 lb of Si). Contract, carload, bulk 7.55c per lb of briquet, packed, pallets, 7.75c; bags 8.75c; 3000 lb to c.l., pallets 9.35c; 2000 lb to c.l. bags 10.35c; less ton 11.25c. Delivered. Spot, add 0.25c. (*Small size* Weighing approx 2½ lb and containing 1 lb of Si). Carload, bulk 7.7c. Packed, pallets 7.9c; bags 8.9c; 3000 lb to c.l. pallets 9.5c; 2000 lb to c.l. bags 10.5c; less ton 11.4c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5-7%, Ti 9-11%). C.l. packed, 19c per lb of alloy, ton lots 20.15c; less ton lots 21.4c, f.o.b. Niagara Falls, N. Y.; freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19% Mn 8-11%). C.l. packed 18.1c per lb of alloy; ton lots 19.55c; less ton lots 20.8c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

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Send blueprints for prompt quotation.

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40 Years of Dependable Service

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2" To 2½" DIAMETER	.060 TO .125
4½" DIAMETER	.060 TO .125
6½" TO 10" DIAMETER	.060 TO .125
11½" OR 12¾" DIAMETER	.085 TO .098

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KEYSTONE LAMP MFG. CORP.

SLATINGTON, PA.,
PHONE: SLATINGTON P. O. 7-3821

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CONTRACT

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Nationally known metal fabricating company has million dollar new plant and immediate production capacity. Facilities include eyelet and transfer presses, single and double action draw presses, heading machines, plating facilities, automatic buffing and lacquering equipment, plus broad experience and facilities in assembly. Can produce parts or complete products. We seek agents who now call on volume users. Exceptional financial opportunity. Send complete experience record.

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Multi-million dollar expansion of our operating facilities has created opportunities in industrial engineering for young men trained or experienced in wage incentive programming, methods engineering, and statistical quality control.

1 to 3 years experience will qualify. Professional status assured. Openings at our Fontana plant in Southern California.

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P.O. Box 217
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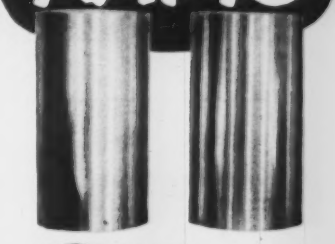


for all types of
HYDRAULIC EQUIPMENT

Hyde Park Rams are available in Chilled or Alloy Iron.

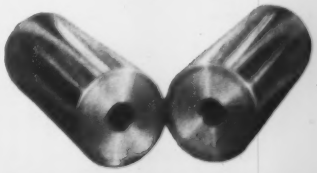
Furnished in hardness range to meet your specification . . . ground to your required size.

On your next replacement of Rams — or for new equipment—consult us. Our engineers will be glad to assist you.

Red Circle Rolls for every Purpose

Rolling Mill Equipment

Gray Iron Castings up to 80,000 lb.



Hyde Park
FOUNDRY & MACHINE CO.
Hyde Park, Westmoreland Co., Pa.
ROLLS
ROLLING MILL MACHINERY
GREY IRON CASTINGS

XVIII

This is the eighteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Methods of Carburizing Alloy Steels

Carburizing is a means of impregnating the surface of steel with carbon, usually to very limited depths. Its purpose is to provide a hard, wear-resisting "case," or outer shell. Alloy steels, correctly handled, can be case-hardened without sacrificing desirable core properties.

There are three types of carburizing in general use. These will be discussed briefly in the following paragraphs:

Liquid Carburizing—The medium here is a hot salt bath composed basically of cyanide compounds. The steel is immersed in the bath, the period of immersion depending upon the analysis of the steel and the depth of case desired. Liquid carburizing produces a thin, hard, wear-resisting case with a maximum practical depth range of 0.02 to 0.03 in. When the steel is quenched directly from the bath, distortion is low.

Gas Carburizing—This method employs a furnace in which a carbonaceous atmosphere is created; i.e., gases that are high in carbon components, or those containing carbon. Steel subjected to gas carburizing can be case-hardened to depths generally ranging from 0.01 to 0.04 in. When quenching takes place immediately after carburizing, distortion can be kept to a minimum.

Pack Carburizing—Where the pack method is used, the parts to be carburized are buried in a container of dry carbonaceous materials. The container is sealed tight to prevent the infiltration of air, placed in a furnace and kept there for eight hours or more, the actual time depending upon the depth of case desired. Pack carburizing is particularly suitable where a deep case is essential (0.06 in. and over), although medium cases in the 0.04-to-0.06-in. range are possible.

The carburizing of alloy steels is a highly technical subject, and Bethlehem metallurgists will be glad to help you with any phase of it. Feel free to consult with them about the results to be expected from various analyses and the various methods of treatment. And when you are in the market for alloy steels of any kind, please bear in mind that Bethlehem Steel makes the complete range of AISI standard grades of alloy steels, as well as special-analysis steels and all carbon grades.

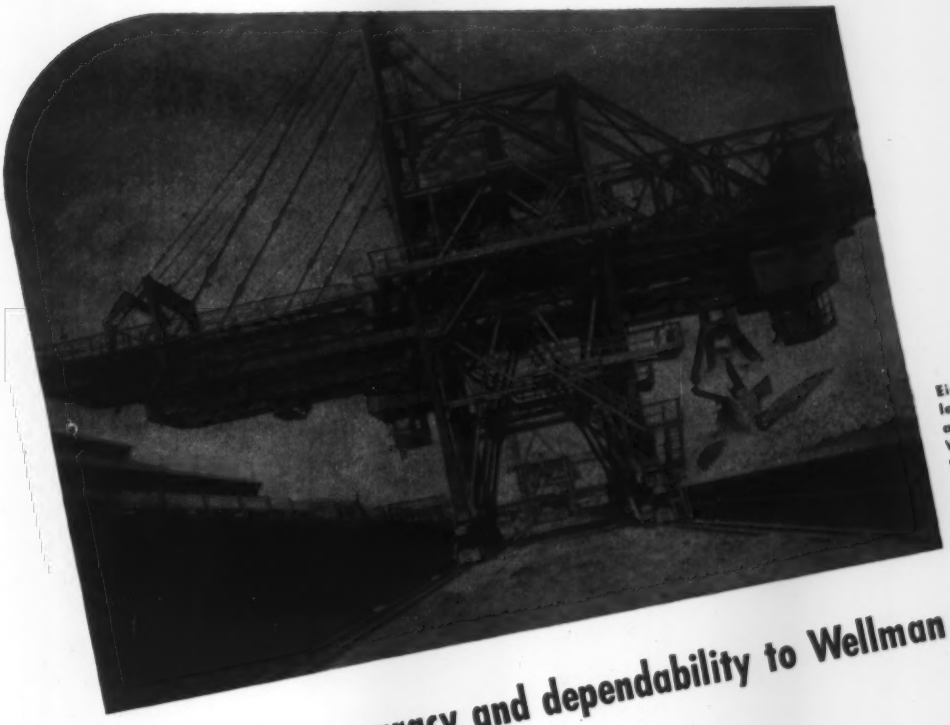
If you would like reprints of this series of advertisements from No. I through No. XVI please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. The first 16 subjects in the series are now available in a handy 32-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Eighteen compact Cleveland Speed Reducers enable operators of these Wellman ore unloaders to quickly and accurately position the grab buckets over the proper hatch of the freighter alongside the dock.

18 CLEVELANDS give accuracy and dependability to Wellman ore unloaders

FOR 37 years, smooth dependable power transmission for many types of Wellman heavy-duty equipment has been supplied by Cleveland Worm Gear Drives.

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These Wellman "Work Horses" must be on the job around the clock to quickly unload ore carriers so they can return to the Iron Ranges for another load during the all-too-short Great Lakes shipping season.

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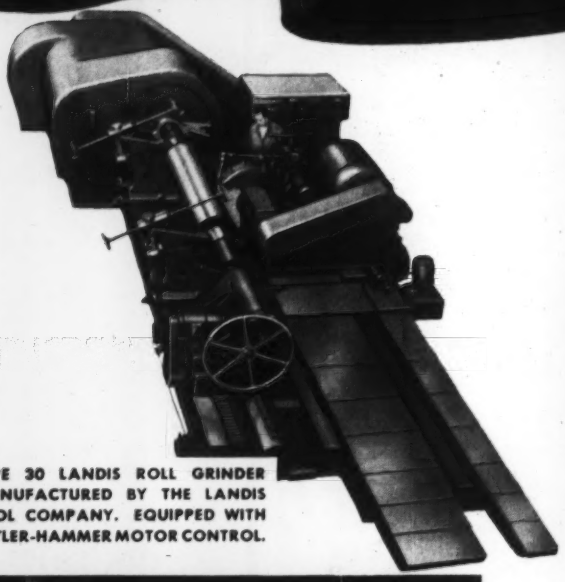

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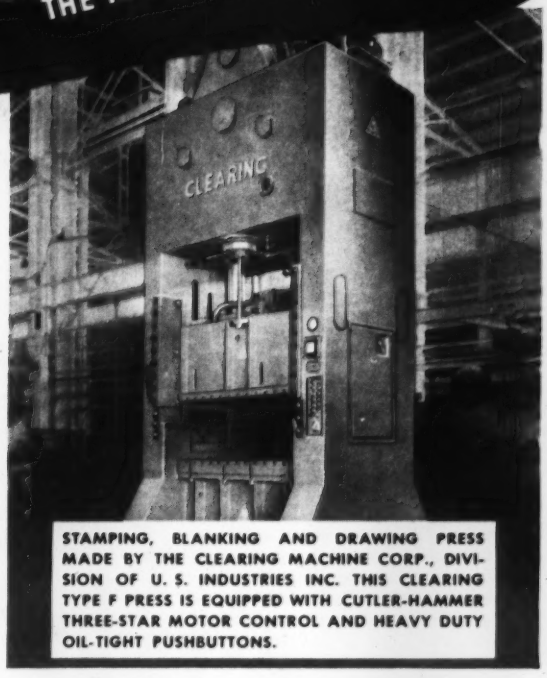

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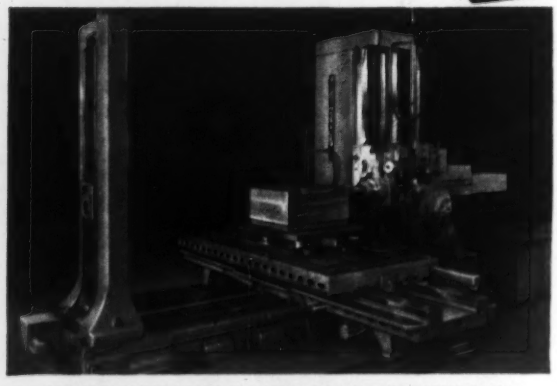

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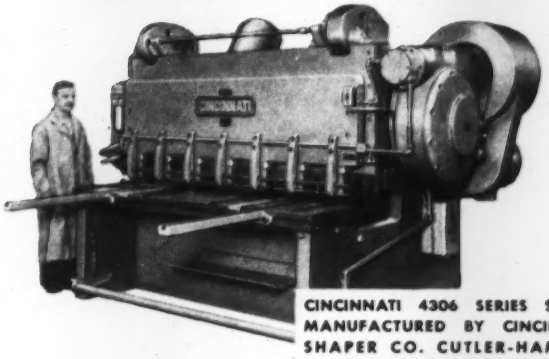

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